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AMERICAN GAS JOURNAL

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BOOTHS 525-526

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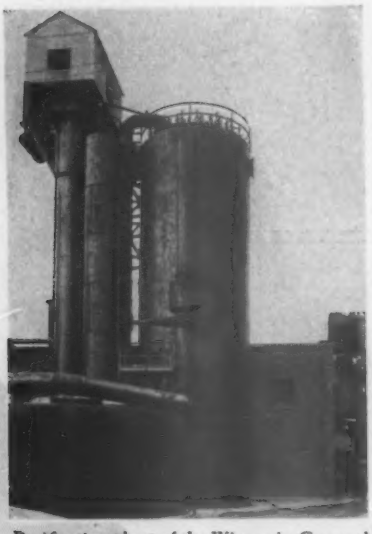
AMERICAN GAS PRODUCTS CORPORATION,
CHRYSLER BUILDING, NEW YORK, N. Y.

A THYLOX SULPHUR RECOVERY PLANT

for purifying water and coal gas



Purification plant of the Wisconsin Gas and Electric Co. at Racine, Wis.

Sulphur recovered as brimstone. Note size of lumps.

Gas officials will be interested in the New Koppers Liquid Purification plant designed and erected at Racine, Wis., for the Wisconsin Gas and Electric Company.

The Thylox Sulphur Recovery Process, is used to purify low pressure, water and coal gas containing approximately 450 Gr. H_2S per 100 cu. ft. High

"Western" offers not only the Thylox Process—but other proved, successful methods—each applicable to meet certain definite, specific conditions.

Our Sales Engineers will be pleased to co-operate with you, and advise as to the process best suited to your particular needs.

THE WESTERN GAS CONSTRUCTION CO.

FORT WAYNE, IND.

"Western Gas" Designs and Builds

A. B. C. Continuous Gasifiers
Naphthalene and Gum Absorbers
Condensing Apparatus
Carburetted Water Gas Plants
Blue Water Gas Plants
Gas Dehydration Plants
Holders (Gas, Oxygen, etc.)
Liquid Purification Plants
Oxide Boxes (Purifiers)
Welded Steel Pipe
Tower and Rotary Scrubbers
Valves

AMERICAN
GAS JOURNAL
Established 1859 *Pioneer of the Gas Industry*
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Executive and Editorial Offices, 53 Park Place, New York City

S. G. KRAKE, *President and Treasurer* A. M. GLEASON, *Secretary*
H. M. RILEY, *Editor*
R. S. MCBRIDE, *Consulting Editor*, Washington, D. C.

Vol. 133, No. 4 October 1930 Whole Number 3682

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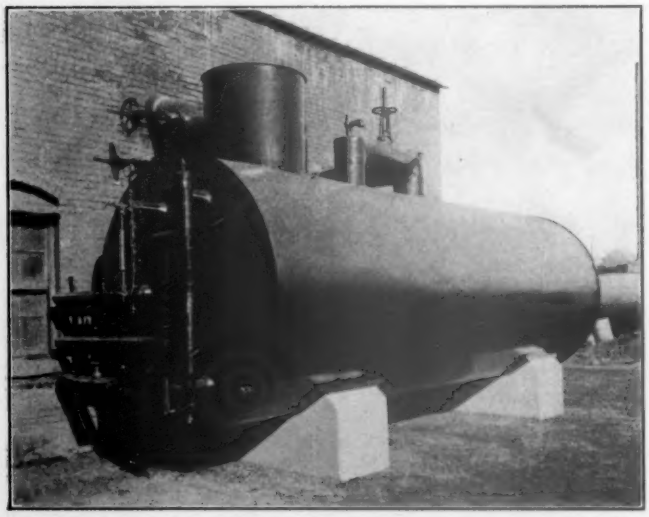
KEEPING PACE With the GAS INDUSTRY



With the refinement of the manufacture of water gas

OVER 70 SMOOT STEAM ACCUMULATORS

have been helping to make water gas economically for over five years.

—and NOW—

With the spread of Natural Gas the use of Mixed Gas is becoming increasingly popular and there is a great demand for simple and accurate mixing equipment.

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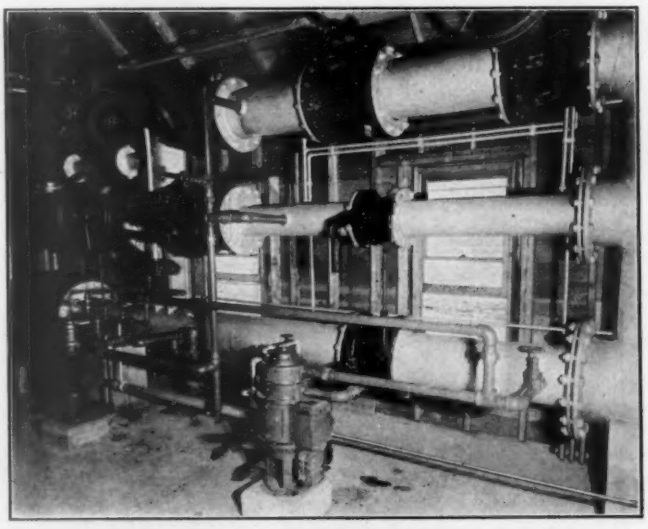
were in service in 1927 and there are now over 20 installations. These gas mixers are operating on natural gas, oil gas, coke oven gas, water gas, blast furnace gas, etc. and handle gas flows up to 1,700,000 cu. ft. per hour.



The Smoot Gas Mixer is a Mechanical Volumetric Control with Regulators which vary the flows of the constituent gases by maintaining the pressures and volumes of the gases in proper proportions.

It is accurate, quick and stable and responds instantly throughout a very wide range to all variations in the quantities of gases entering or leaving the mixer.

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Smoot Engineering Corp., 136 Liberty St., New York

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IN many by-product plants, phenol can be recovered on a cost basis justifying an installation of the highly economical Semet-Solvay unit, designed for this purpose.

We are prepared to equip your plant with a phenol recovery installation that will be independent of other by-product recovery apparatus. Operating costs are attractively low. No additions to plant personnel are necessary.

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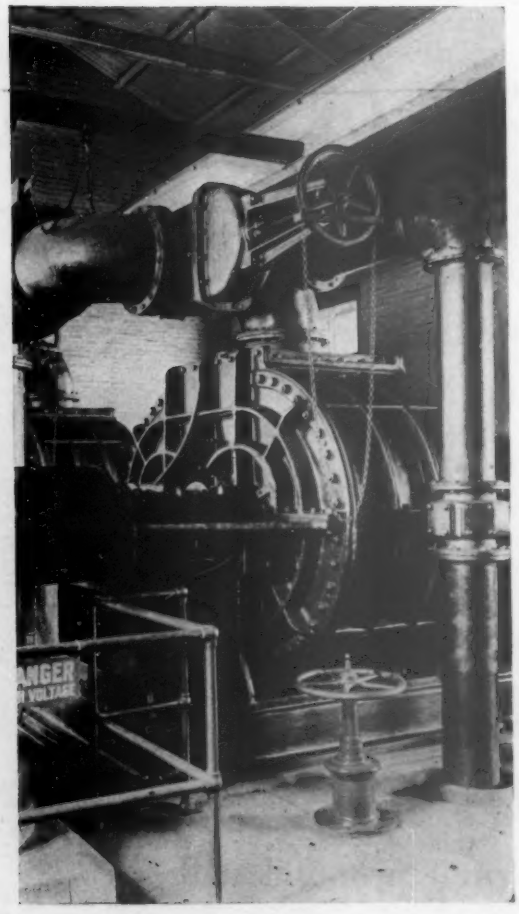

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Blower Division

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Assured Supply At Low Cost

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Maintenance costs are low, even over a period of years.

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Grant these advantages to high pressure holders, then ask, "For how long?"

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STACEY BROTHERS

Holder Division

The Stacey Engineering Company

STACEY BROTHERS
GAS CONSTRUCTION CO.

5535 CARTHAGE PIKE
CINCINNATI, OHIO

CHICAGO
20 N. Wacker Drive

NEW YORK
420 Lexington Ave.

We've 2 things to tell you
and
1 Question to ask . . .

1. That we'd like very much to have you come to see us at the convention. Our booth is 705.

2. That this is an installation just finished at Dallastown, Pa. 50,000 Cu. Ft. Pressure Holder; 20'0" diameter; 53'10" long. Designed for 50 pounds working pressure

3. MAY WE SEND THIS?

It's our new monthly publication designed simply to be a review of interesting industrial news.

CRUSE-KEMPER CO.
AMBLER, PA.

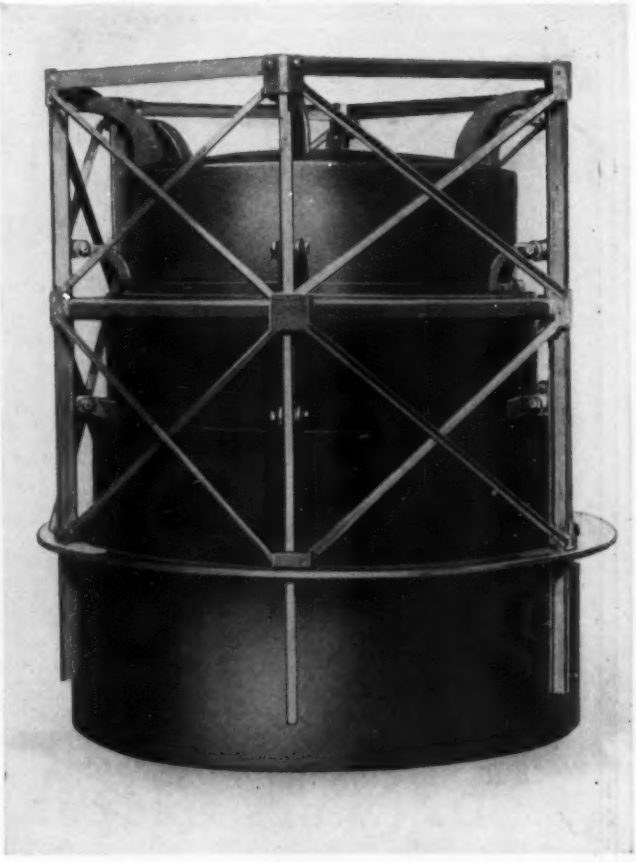
Manufacturers of GAS HOLDERS and other major equipment for the GAS INDUSTRY.

Every day during the A. G. A. Convention

this holder will be

PAINTED AUTOMATICALLY

Don't miss seeing the demonstration AT BOOTH 12



A Revolutionary method for permanently protecting holders at a low cost

Here is an opportunity to see at close range how easily an IMUNOL treatment can be applied to your own holders. No scraping, no de-rusting, no scaffolds, no painters are needed when you use this unique material. It will pay you to drop in at booth 12 and learn how to put an end to rust and corrosion on your Gasholders.

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Actual photos of what IMUNOL can do on your holder lifts.

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BOOTH 402

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Drawings and data relative to our

MECHANICAL GRATE FOR WATER GAS SETS

will be available to those interested

This is an outstanding development of the industry

BOOTH 402

TO BETTER SERVE THE GAS INDUSTRY

COME AND SEE US

CONVENTION time is when we renew old friendships and make new friends. Here at Atlantic City, under one roof, are gathered gas men from everywhere.

Many of you we know and can chat with on personal matters; others we have communicated with only through the mails on subjects relating to coal carbonization.

We want to meet you all! Drop into Booth 15—between sessions or whenever convenient,—make yourself comfortable. Let us discuss our particular hobbies—conjure up the conventions of the past and the old gasmen we both know—make it a regular get-together affair.

Come! if it is only to say "Howdy!"

A Cordial Welcome Awaits You In
BOOTH 15

Main Office
24 State St., New York

Branch Office
205 W. Wacker Drive, Chicago, Ill.

IMPROVED EQUIPMENT RUSSELL ENGINEERING
NEW YORK ▲ CORPORATION ▲ CHICAGO

MORE USED EVERY YEAR !

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Welcome at booth 617

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For Patching Hot Retorts, Refractory Linings, etc. Shipped in 110 lb. Bags.

Order Sample Shipment Today!

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Chicago Office: 343 S. Dearborn Street

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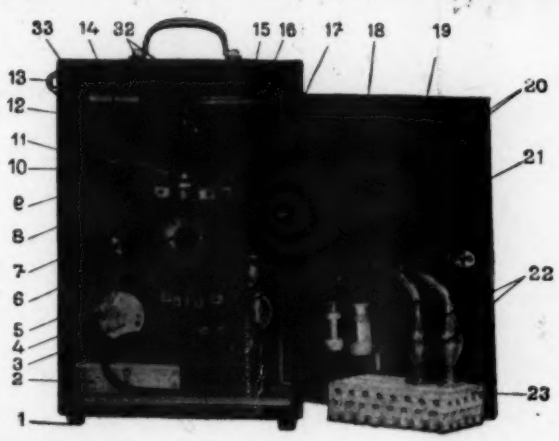
192 FRONT STREET

HAND CALORIMETER

Dr. Strache-Kling (Loeffler Model)

For Determining the Heating Value of Gases



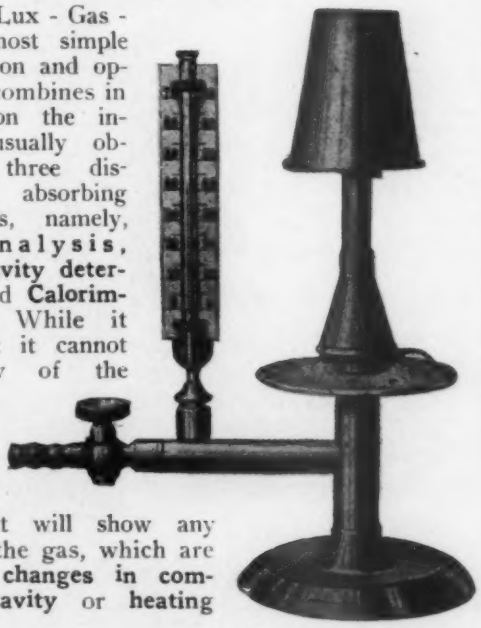
1. It is portable (weight under 10 lbs.)
2. It is accurate.
3. It requires only small quantities of gas for each determination.
4. It requires no water connection.
5. A determination can be made in one minute.
6. It can be operated by anybody without special training.
7. It does not require standardizing by H_2+O gas.
8. Its cost is reasonable.

The principle involved is the burning of an air gas mixture, of a known quantity of gas with a definite volume of air, in an explosion pipette insulated by means of a Dewar Vacuum jacket.

The temperature rise is recorded on an inserted thermometer. Each instrument is equipped with a computer table.

DR. OTT-LUX-GAS TESTER

For Indicating Change in Gravity of Gas, also in Heating Value of Gas



Dr. Ott - Lux - Gas - Tester is most simple in construction and operation. It combines in one operation the information usually obtained by three distinct time absorbing manipulations, namely, the **Gas Analysis, Specific Gravity determination** and **Calorimeter test.** While it is true that it cannot replace any of the three tests, where specific results are required it is equally true that it will show any changes in the gas, which are caused by **changes in composition, gravity** or **heating value.**

LUX-RECORDING GAUGE

For Specific Gravity of Gas

(Simmance and Abady System)

To determine the Specific Gravity of manufactured gas is, today, as essential to the smooth running of a gas plant, as the determination of pressures and heating values.

In the Simmance Abady System-Lux-Recording Specific Gravity balance, we have an instrument which will give us, at a glance, not only any changes that may have occurred at any time, but furnishes a permanent record of the Specific Gravity of the gas throughout the 24 hours of the day.

LUX COMPANY INC.

NEW YORK CITY, N. Y.

THE BUILDERS OF STACEY

Illustration shows section of Guide Frame and Stairway of 5,000,000 cu. ft. capacity five lift Holder built at Flint, Michigan, in FOUR MONTHS — May 1st to August 30th, 1930.

This sets forth the substantial construction and simplicity of design, which give to the STACEY MANUFACTURING COMPANY Holders long life and low maintenance cost.

AN INDEPENDENT ORGANIZATION NOT AFFILIATED WITH ANY OTHER BUILDERS OF GAS HOLDERS

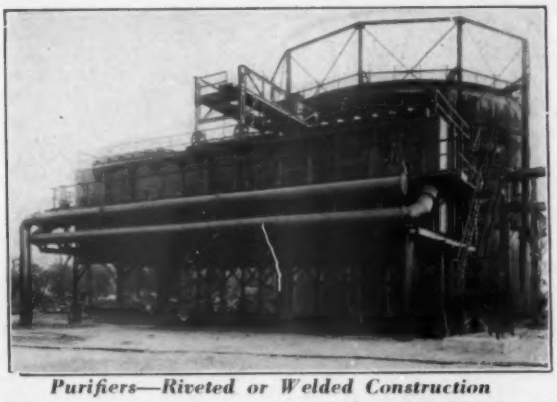
STACEY SINCE 1851

BOOTH 400
A. G. A. CONVENTION

GAS PLANT EQUIPMENT

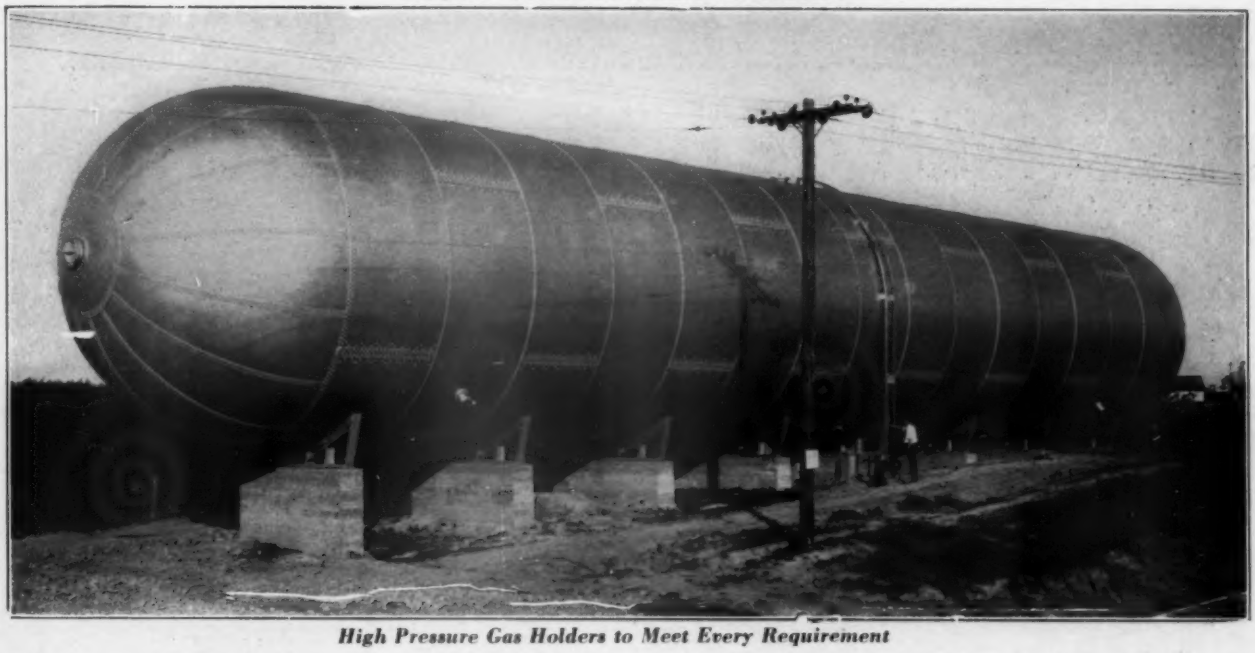
HOLDERS FOR 79 YEARS

1851



1930

Purifiers—Riveted or Welded Construction



High Pressure Gas Holders to Meet Every Requirement

Pioneer Builders of High and Low Pressure Gas Holders

THE STACEY MANUFACTURING CO.

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CINCINNATI, OHIO

NEW YORK OFFICE:
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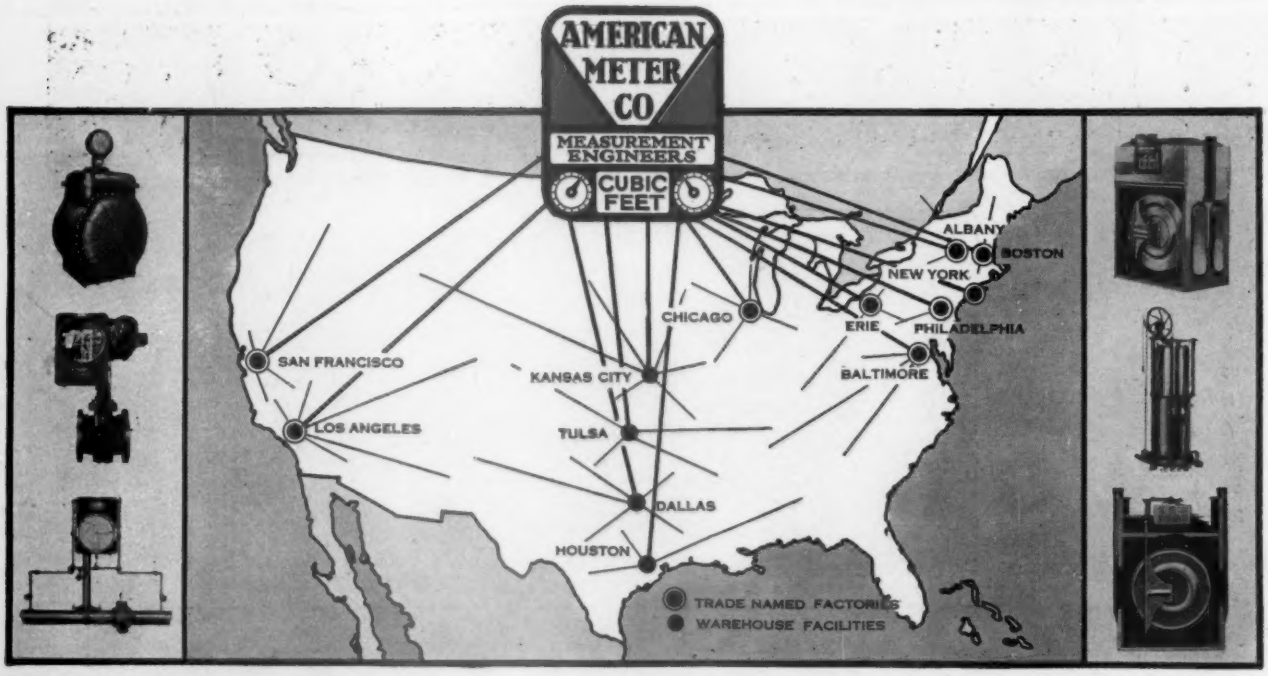
STACEY SINCE 1851

GAS HOLDERS—PURIFIERS

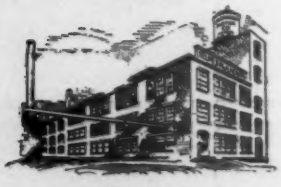


Conveniently Located Factories

American Meter Company
New York
Established 1836

American Meter Company
Chicago
Established 1896

John J. Griffin & Company
Philadelphia
Established 1839



Haines & McIlhenny
Philadelphia
Established 1848

supported by nation-wide experience and facilities

Ninety-four years ago — shortly after the first gas plant was founded in this country — American Meter Company opened its first factory. Today American Meter Company supplies the gas industry from ten trade-named factories strategically located from coast to coast.

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New Types Developed

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"Gas Measurement Engineering," a periodic publication of American Meter Company will be of interest to you—also the complete index to this Company's other printed information. We will be pleased to place your name on our mailing list.

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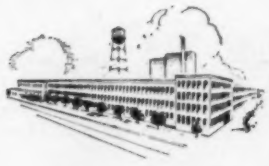
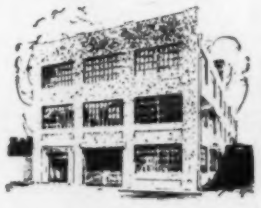
Booths 327-9 and 403-5

D. McDonald & Company
Albany
Established 1853

Maryland Meter Works
Baltimore
Established 1866

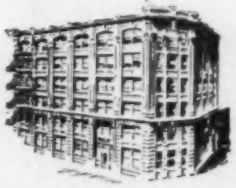


Metric Metal Works
Erie, Pa.
Established 1888



Pacific Meter Works
Los Angeles
Established 1901

Pacific Meter Works
San Francisco
Established 1901



Nathaniel Tufts Meter Works
Boston
Established 1860

AMERICAN METER COMPANY

Incorporated

General Offices: 105 West 40th Street, New York, New York . . . . Established 1836

THE WORLD'S LARGEST MANUFACTURERS OF GAS METERS AND ALLIED APPARATUS

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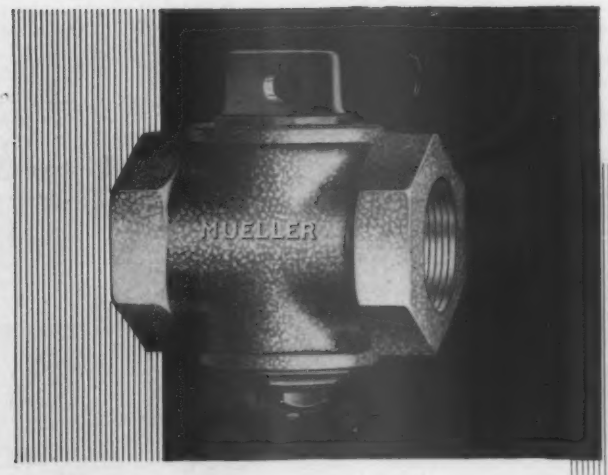
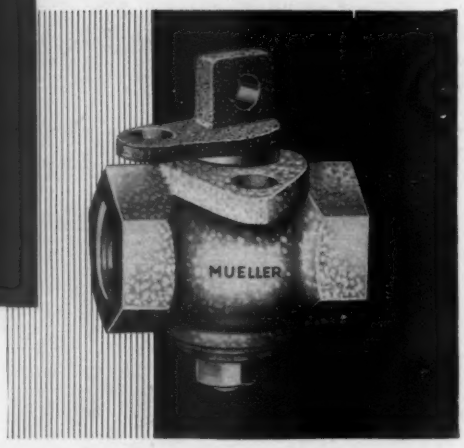
SERVICE LOS ANGELES · NEW YORK · PHILADELPHIA · PITTSBURGH · SAN FRANCISCO · TULSA



At right: Mueller G-11080 Iron Body Brass Plug Meter Stop.

At left: Mueller G-11100 Flat Head, Iron Body Brass Plug Service Stop



Year in and year out

they serve you faithfully

We don't attempt to say that Mueller Gas Stops will wear a thousand years. That, of course, is impossible.

We do claim, however, that Mueller Gas Stops know no superior from the standpoint of design, material, and mechanical perfection. They are in all truth as nearly perfect as it is possible to make them.

Some seventy-five years of experience in the design of plumbing, water and gas brass goods are behind every one of them. Is it any wonder that year in and year out they serve you faithfully?

MUELLER CO., (Established 1857) Decatur, Ill. *Branches,* New York, Dallas, Atlanta, San Francisco, Los Angeles, Chicago. *Canadian Factory:* MUELLER, Limited, Sarnia.

MUELLER

THE OUTSTANDING DEVELOPMENT IN CARBURETTED WATER GAS MANUFACTURE

* * *

THE U.G.I. HEAVY OIL PROCESS

(Patented)

As successfully used at Philadelphia, Newark, Atlantic City, Norwalk and New Haven, Conn., and Long Branch, N. J.

* * *

We shall be glad to discuss the savings which the U. G. I. Heavy Oil Process makes possible in your plant.

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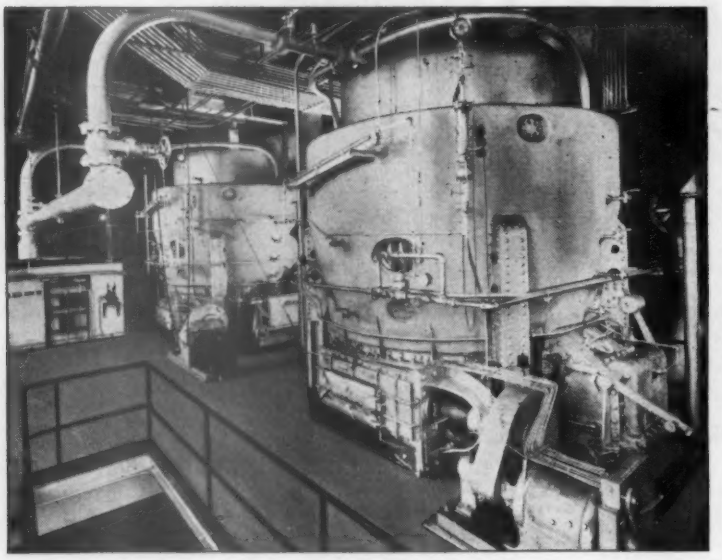
MAXIMUM RETURN TO CLIENTS PER DOLLAR INVESTED

U. G. I. MECHANICAL GENERATOR



Three U. G. I. Mechanical Generators in the Chester, Pa., Plant of the Philadelphia Electric Company.

For PEAK LOADS with Manufactured and Natural Gas

The U. G. I. Mechanical Generator, in addition to its base load use, offers important advantages for peak load gas supply.

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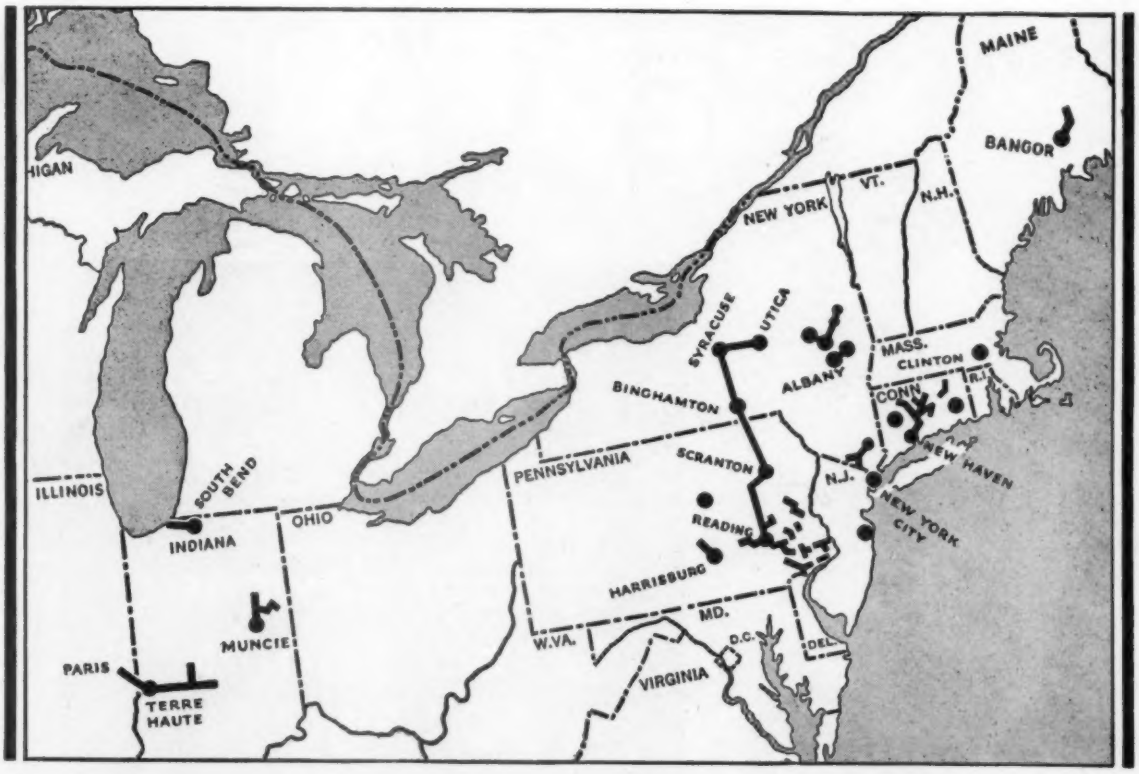

Pipe Lines and Gas Distribution Systems

completed or under construction

COMPLETELY organized with equipment and personnel for pipe line construction and gas distribution work, we can efficiently and economically handle jobs of any size, from a few thousand feet of gas distribution main to cross-country oil, natural gas or gasoline lines of any length.

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DWIGHT P. ROBINSON, PRESIDENT

Philadelphia
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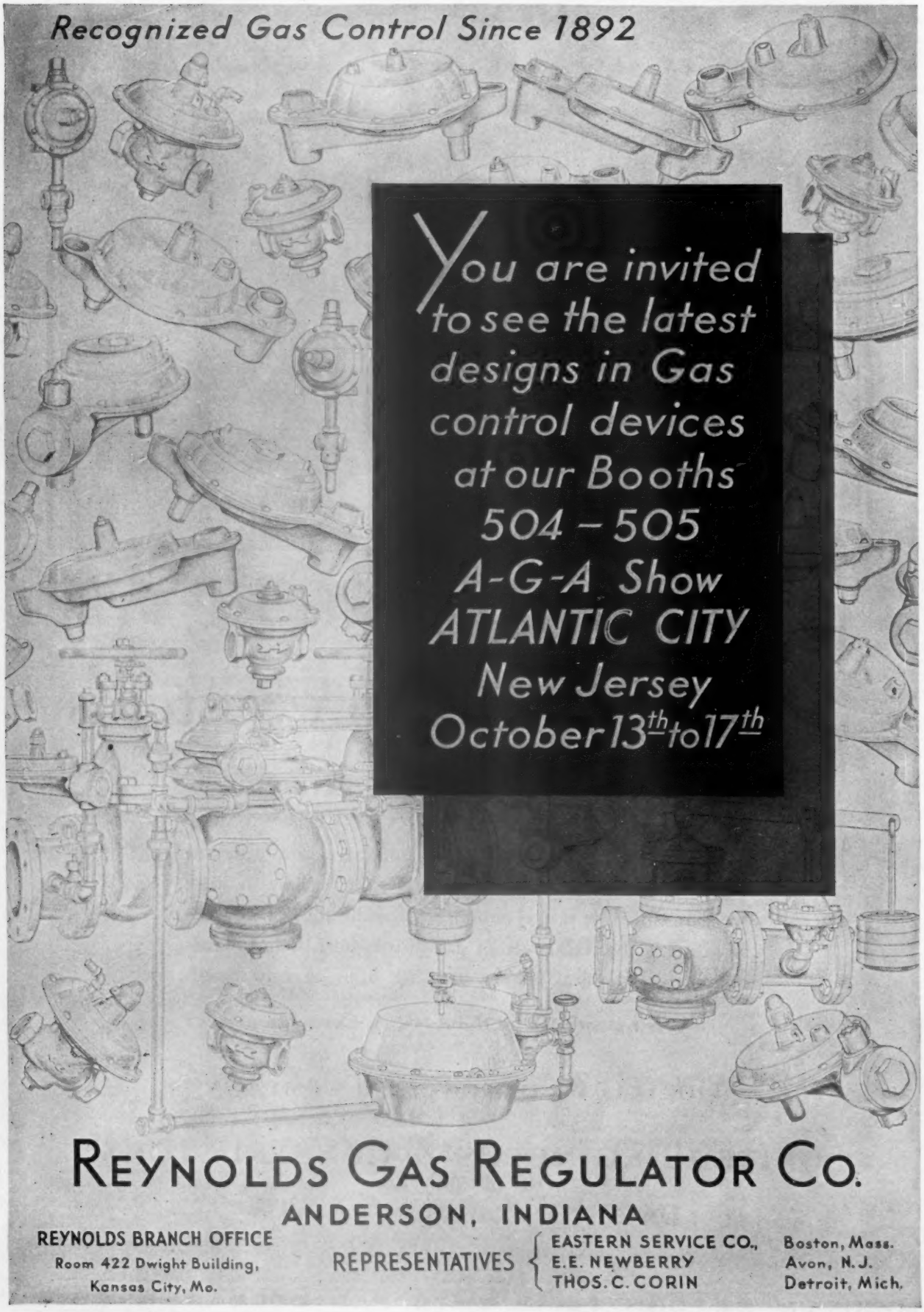
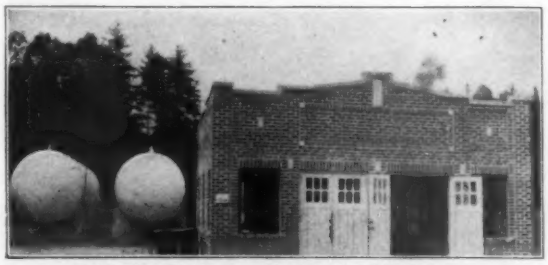
MAXIMUM RETURN TO CLIENTS PER DOLLAR INVESTED


Recognized Gas Control Since 1892
You are invited to see the latest designs in Gas control devices at our Booths 504 – 505 A-G-A Show ATLANTIC CITY New Jersey October 13th to 17th
REYNOLDS GAS REGULATOR CO.
ANDERSON, INDIANA
REYNOLDS BRANCH OFFICE
Room 422 Dwight Building,
Kansas City, Mo.
REPRESENTATIVES
EASTERN SERVICE CO., Boston, Mass.
E.E. NEWBERRY Avon, N.J.
THOS. C. CORIN Detroit, Mich.

BUTANE « «

« « « « « « FOR GAS MANUFACTURING



TENNESSEE GAS CO., HENDERSONVILLE, N. C.

WESTERN GAS & UTILITIES CORP., GOODLAND, KANSAS

MISSOURI PUBLIC SERVICE CO.
CLINTON, MO.

NORTHLAND UTILITIES CO.
CHISHOLM, MINN.

MARYVILLE ELECTRIC LIGHT & POWER
COMPANY, MARYVILLE, MO.

G-4
PHILFUEL

Thirty plants are now manufacturing Butane—Air gas by the Philfuels Process. The illustrations show five of these plants.

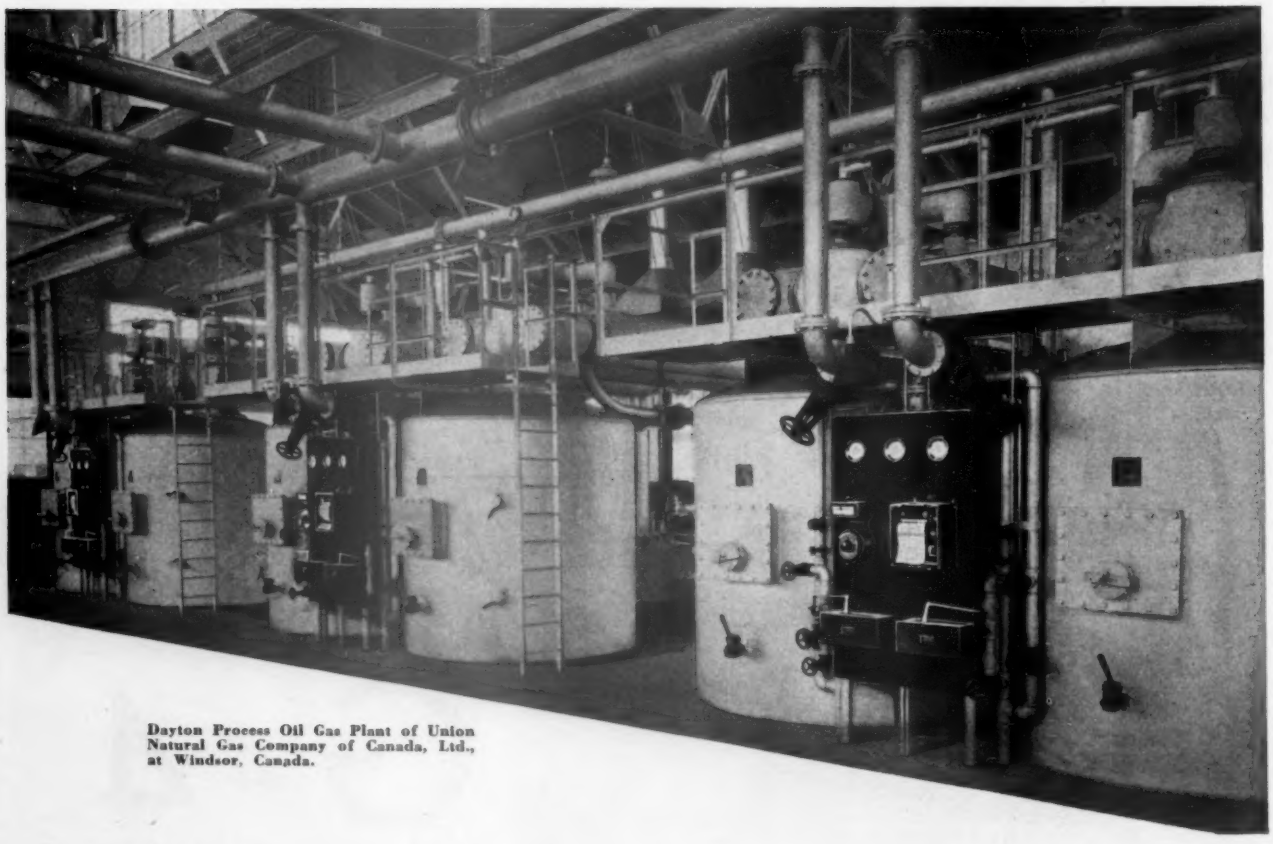
An invitation is extended to the Gas Industry to visit Booths 416 and 417 at the annual A. G. A Convention, Atlantic City, October 13-17 where a complete Philfuels Process plant will be in operation.

Gas Manufacturing Division

« PHILFUELS COMPANY »

(Subsidiary of Phillips Petroleum Company)

7-101 GENERAL MOTORS BLDG. - DETROIT, MICHIGAN



Dayton Process Oil Gas Plant of Union Natural Gas Company of Canada, Ltd., at Windsor, Canada.

Automatic Controls a Feature in Crack Gas Plant

During an emergency last Fall the plant pictured above was called upon to jump into production with an output of 2½ million cubic feet of oil gas per day—at very short notice. Gas was being supplied to the mains in less than an hour after word was received.

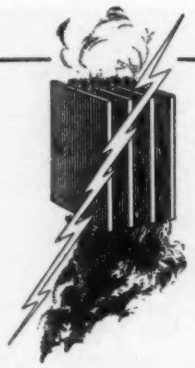
As might be expected, this plant is fully equipped with automatic controls—including Brown Automatic Control Recording Pyrometers, together with Brown Indicating Pyrometers for checking.

Wherever characteristics of reliable operation within close limits are required Brown Automatic Control equipment meets the need efficiently.

THE BROWN INSTRUMENT COMPANY
4473 Wayne Ave., Philadelphia, Pa.
Branches in 20 principal cities

Brown Automatic Controls

To Measure is to Economize



COTTRELL

ELECTRICAL PRECIPITATION PROCESSES

for the removal of

DUSTS, FUMES, MISTS, TARS

and OTHER SUSPENDED MATTER from GASES

The following applications of the Cottrell Processes are established by satisfactory performance and the removals effected being only dependent on the Purchasers' requirements.

Carburetted Water Gas . .	95%—99%	removal
By-Product Coke Oven Gas .	95%—99%	"
Powdered Coal Ash.	90%—95%	"
Carbon and Lamp Black . .	95%—99%	"
Hot Roaster Gas	95%—99%	"
Sulphuric Acid Mist	95%—99%	"
Contact Acid Gas Purification	99%	"
Phosphoric Acid Recovery . .	95%—99%	"
Miscellaneous Applications .	90%—99%	"

Our experience gained through the construction and successful operation of Cottrell Electrical Precipitation Process Installations of a total gas capacity exceeding 10,000,000 cubic feet per minute treating different types of gases enables us to intelligently study any new problem in gas cleaning. If our Process can be adapted, we are prepared to offer a complete installation guaranteed to effect the desired result.

Gas Detarring
Blast Furnace Gas Cleaning
Powdered Fuel Ash Removal
Carbon and Lamp Black Recovery
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Air Cleaning
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1876 · FOR 54 YEARS · 1930

PURIFYING MATERIAL

Nearly half a century ago Connelly developed the well known Iron Sponge. A newer product called Iron Sponge Precipitate has since been invented and a modern plant has been equipped to produce it.

Come and see us in

BOOTH 201

CONNELLY SERVICE GOVERNORS

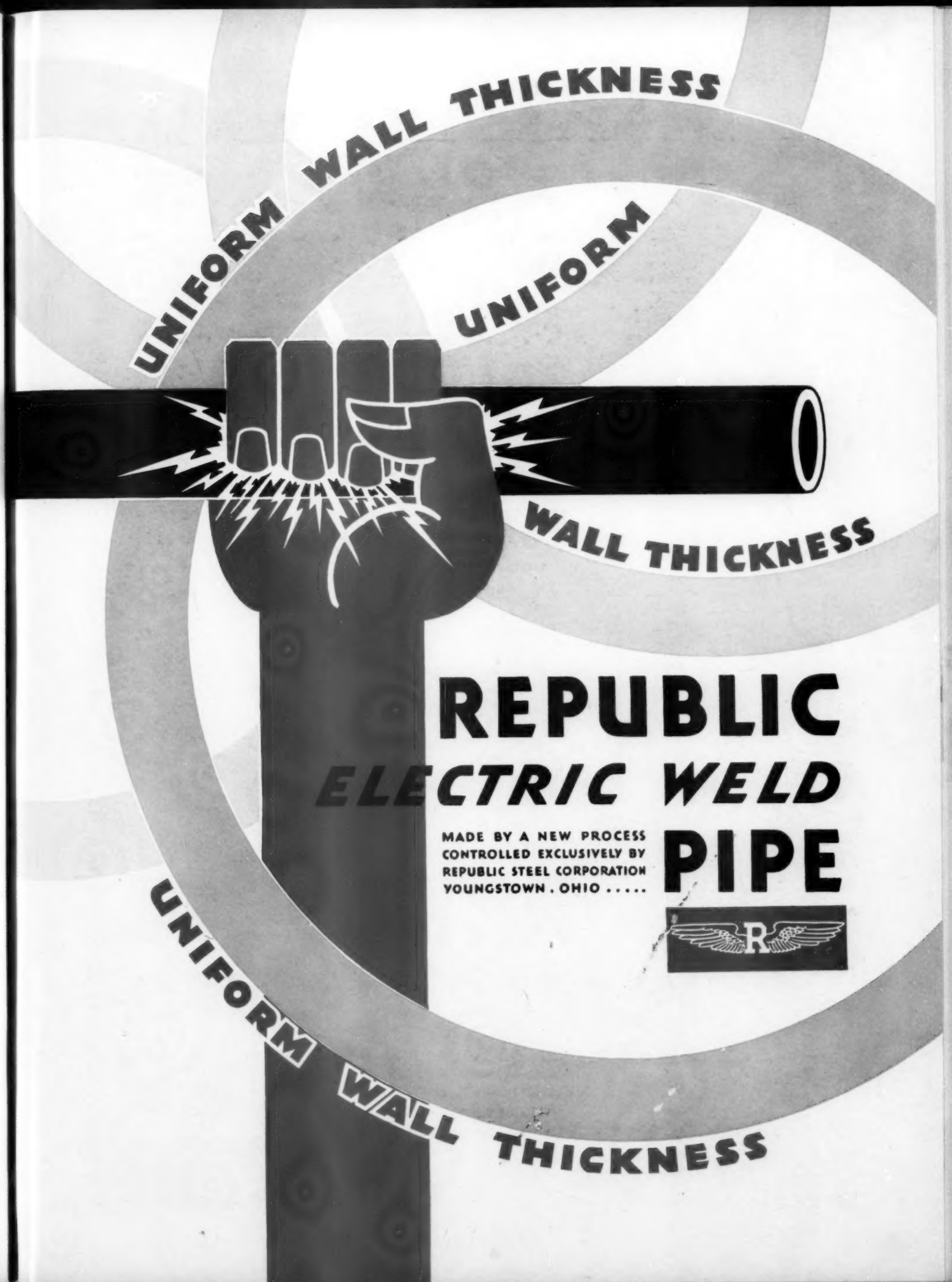
The Connelly Type D-C Gas Governor, illustrated, is designed to control an inlet pressure up to 2 lbs. per sq. inch while maintaining an outlet pressure that is manually adjustable by the expediency of applying dead weights directly upon the diaphragm.

OUR OTHER PRODUCTS

Station Governors
District Governors
Service Governors
Compensator
Fuel Gas Governors
Gas Main Bags and Stoppers
Gas Testers
Jones Jet Photometer
Iron Sponge Precipitated
Counter Balanced Manholes
Back Pressure Valve
Gas-Tar Separators and Burners
Gas Tape
Respirating and First Aid Outfits
Pressure Gauges
Tools, Street Dep't Requisites
Millers Grip Packing
Gas Screen
Cabot Trays and Grids

CONNELLY IRON SPONGE & GOVERNOR Co

MAIN OFFICE AND PLANT: ELIZABETH · N.J. — BRANCH OFFICE AND PLANT CHICAGO


UNIFORM WALL THICKNESS
UNIFORM
WALL THICKNESS
REPUBLIC
ELECTRIC WELD
MADE BY A NEW PROCESS
CONTROLLED EXCLUSIVELY BY
REPUBLIC STEEL CORPORATION
YOUNGSTOWN . OHIO . . . . .
PIPE
R
UNIFORM WALL THICKNESS

"MIKE" THE WALL ANYWHERE

THE WELD
Guaranteed 100%.
Stronger than the parent metal.
No foreign metal added.
Perfectly smooth, inside and outside.

THE PIPE
Uniform wall thickness.
Perfectly round, inside and outside.
Scale and oxide removed, inside and outside.
Easy to weld and bend.
Lengths up to 50 feet.
Sizes, 4 to 16 inch.

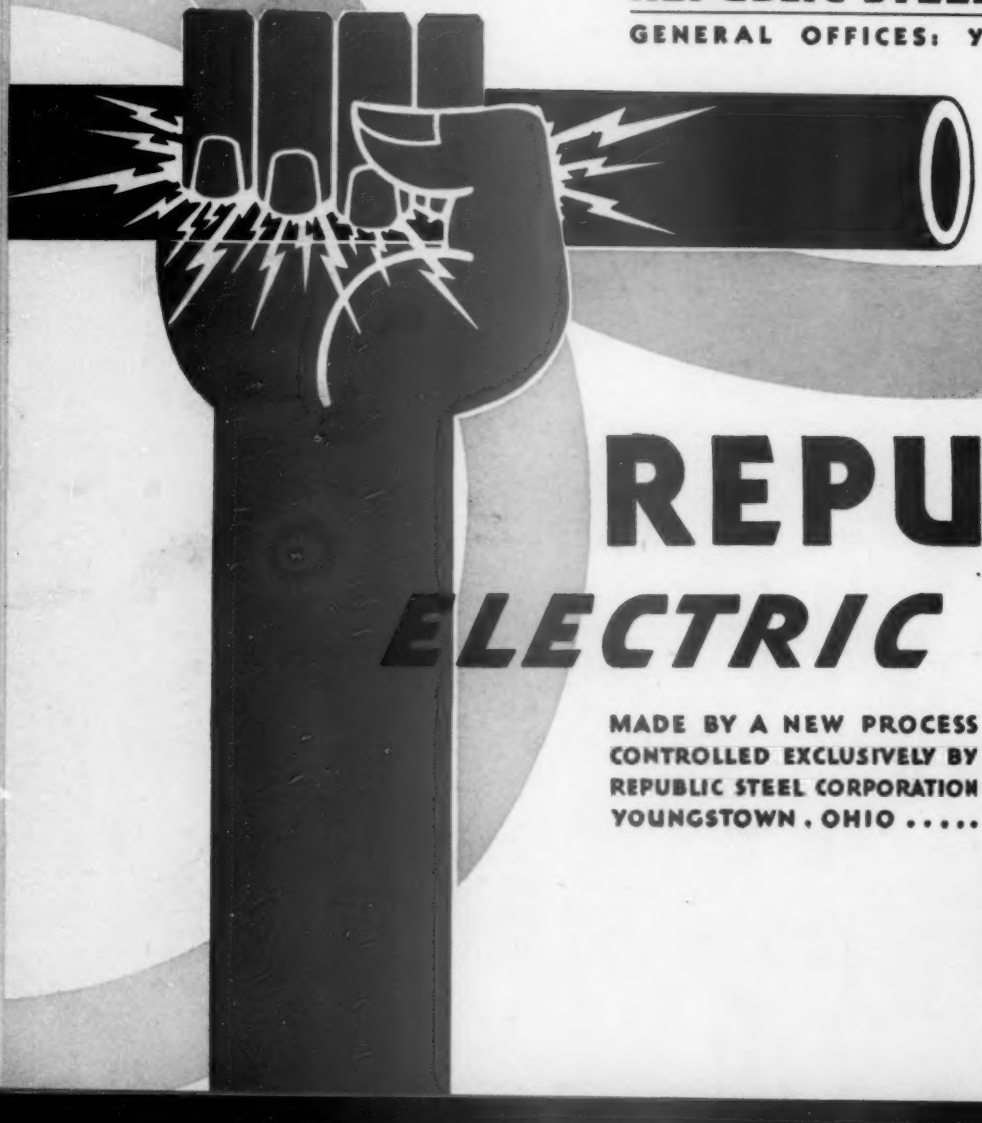
PLANT CAPACITY
30 to 40 miles of pipe per day.

Just to satisfy your curiosity, use a micrometer on your first shipment of Republic Electric Weld Pipe. An unusual uniformity of wall thickness will be apparent. Yet the explanation is quite simple.

To begin with the skelp is rolled accurately to gauge. It is shaped cold. No furnace heatings to soften the metal—no drawing while hot through bending blocks and welding rolls—nothing to distort the metal or cause strains in the metallic structure. Heat is applied electrically only where fusion takes place to form a perfect weld, and thickness at the weld is the same as at any other point in the pipe wall.

Uniform wall thickness means uniform strength, uniform resistance to corrosion, full value for every dollar invested in this mechanically perfect pipe.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES: YOUNGSTOWN, OHIO

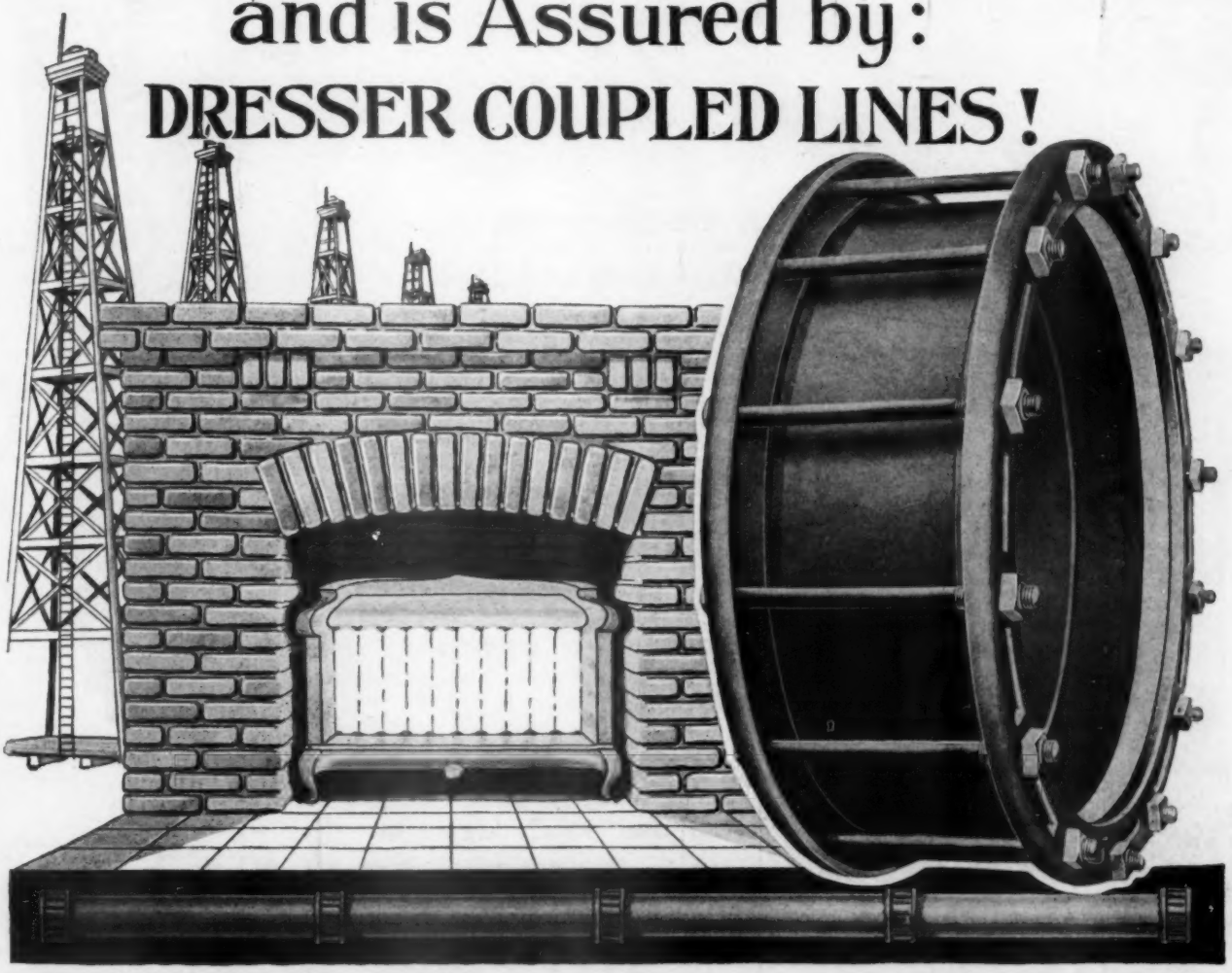


REPUBLIC ELECTRIC WELD PIPE

MADE BY A NEW PROCESS CONTROLLED EXCLUSIVELY BY REPUBLIC STEEL CORPORATION YOUNGSTOWN . OHIO . . . . .

The Comfort of Millions Depends upon and is Assured by:

DRESSER COUPLED LINES!



DRESSER

Couplings Dominate

1880 S. R. DRESSER MFG. COMPANY BRADFORD, PENNA. 1930

"For every joint on every line"

Unanchored **pipe lines connected with Victaulic Couplings are giving faultless service under both constant and intermittent pressures of over a thousand pounds per square inch.**

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Available for steel, wrought iron, cast iron and spiral weld pipe—all sizes from ¾" up—for all working pressures. See Sweet's Page 451. Mail the coupon below.

VICTAULIC COMPANY OF AMERICA
26 Broadway New York

"For every joint on every line"

FLEXIBLE LEAK-PROOF

VICTAULIC

REG. U.S. PAT. OFF.

PIPE COUPLINGS

VICTAULIC DISTRIBUTORS

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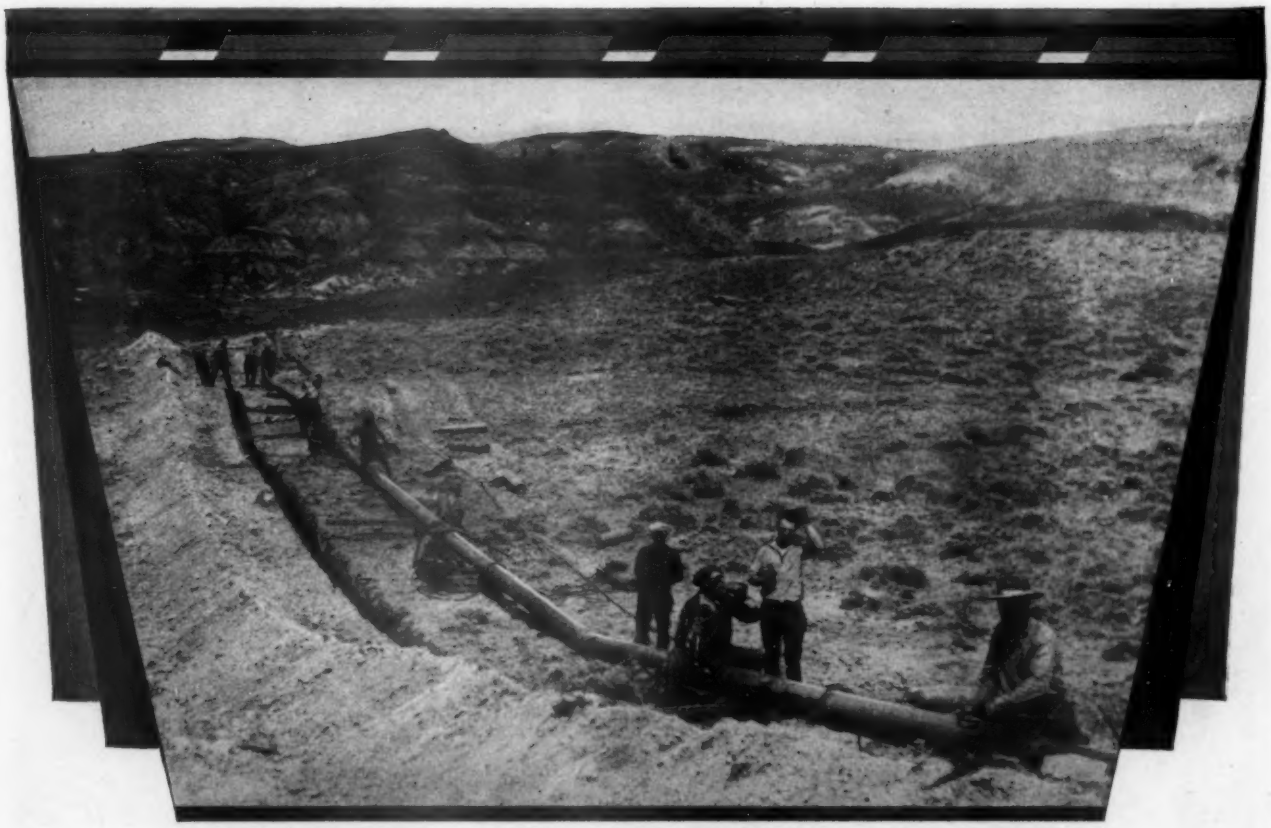
FOR OIL, GAS, WATER, SEWAGE, COMPRESSED AIR, ETC.

COUPON
For uses, installations, specifications and prices, fill in and mail this coupon.

VICTAULIC COMPANY OF AMERICA
26 Broadway New York
Please send me VICTAULIC BULLETIN No. 7

Name_____
Address_____



• • • • • • TO PRODUCE DEPENDABLE WELDS

IN welding gas and oil pipe lines selection of materials and instruction in correct welding technique are important factors of good welding practice . . . Under Linde Procedure Control careful and studied selection of materials and application of proven methods make oxwelded joints as strong as the pipe and permanently leakproof — 100 per cent efficient.

THE LINDE AIR PRODUCTS COMPANY . . . THE PREST-O-LITE COMPANY, INC. . . . OXWELD ACETYLENE COMPANY . . . UNION CARBIDE SALES COMPANY,

Units of UNION CARBIDE AND CARBON CORPORATION

General Offices . . . . . New York UCC **Sales Offices . . . In the Principal Cities**

65 Linde plants . . . 48 Prest-O-Lite plants . . . 174 Oxygen Warehouse stocks . . . 156 Acetylene Warehouse stocks
42 Apparatus Warehouse stocks . . . 245 Union Carbide Warehouse stocks

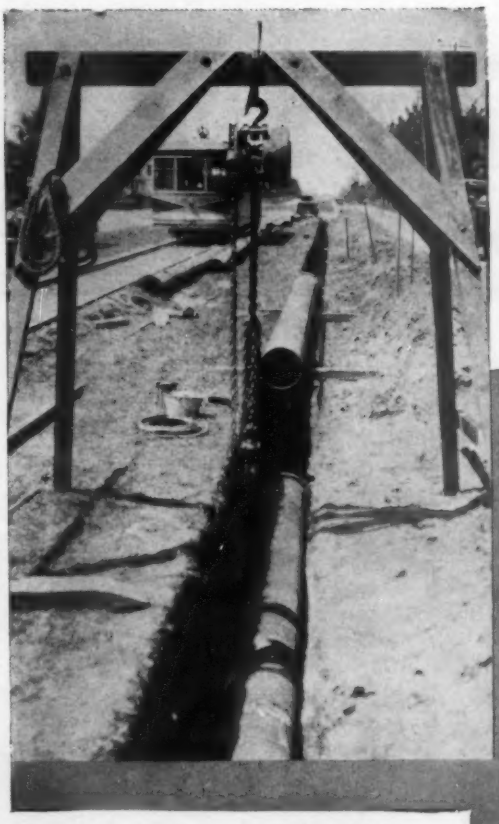
CAST IRON GAS MAINS PROVE *TIGHT and EFFICIENT*

The installation shown by the above photograph offers ample justification of the confidence which gas engineers are placing in cast iron pipe for high pressures. Here is a cast iron gas main subjected to constant exposure and vibration, under a normal working pressure of 185 lbs. per square inch. This line was previously tested to 250 lbs. per square inch for a full hour without the sign of a leak.

Today's demand for an increasing volume of gas — natural as well as artificial — finds cast iron pipe available in sizes and specifications to take care of every demand.

With its known record of durability and strength, cast iron pipe offers an economical and dependable means of gas distribution. For improvements in cast iron gas pipe manufacture and developments in joint design enable cast iron pipe to show a record of outstanding performance under high gas pressures.

For latest information regarding cast iron pipe and joints for high pressure gas mains, write to The Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, 309 Peoples Gas Building, Chicago, Illinois, or any of the individual companies listed on opposite page.



Showing the ease of installation of Cast Iron high pressure gas mains

Section of a 30,000 ft. high pressure cast iron gas line using special type joints.

UNDER HIGH PRESSURES

A New York Manager writes:

"At the present time, we have in use approximately 40 miles of cast iron gas pipe. The pressure which is carried in this system ranges from a minimum of 30 pounds to a maximum of 60 pounds in every twenty-four hours... I would like to further state that Cast Iron Pipe has been in service for the distribution of gas in this company prior to the year 1900 and we are only too glad to state that we are getting exceptionally good results."

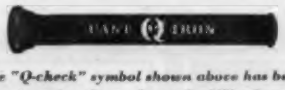
Another states:

"In 1928 we installed about a mile of 10-inch line, bell and spigot joints under pavements. This line has been used under 75 lbs. pressure and no leaks have been found... The same year, we laid about 5,000 feet of 4-inch cast iron pipe. The line carried 50 lbs. pressure with no leaks reported on the test or since the installation. We had excellent results with these installations."

And still another:

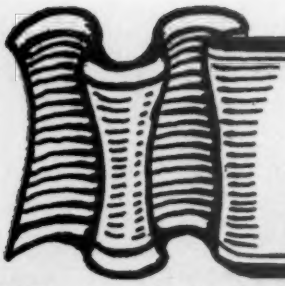
"The installation was very satisfactory, and on completion was subjected to 250 pounds gas pressure for four days without appreciable leakage. Since then the daily pressure is from 90 to 125 pounds."

Cast iron pipe bearing the "Q-check" trade mark is obtainable from the following leading pipe founders: Alabama Pipe Company, Anniston, Ala.; American Cast Iron Pipe Company, Birmingham, Ala.; James B. Clow & Sons, 219 N. Talman Avenue, Chicago, Ill.; Donaldson Iron Company, Emaus, Pa.; Glamorgan Pipe and Foundry Company, Lynchburg, Va.; Lynchburg Foundry Company, Lynchburg, Va.; National Cast Iron Pipe Company, Birmingham, Ala.; United States Pipe and Foundry Company, Burlington, N. J.; Warren Foundry and Pipe Co., 11 Broadway, New York.



The "Q-check" symbol shown above has been adopted as the trade mark of The Cast Iron Pipe Research Association.

CAST IRON PIPE



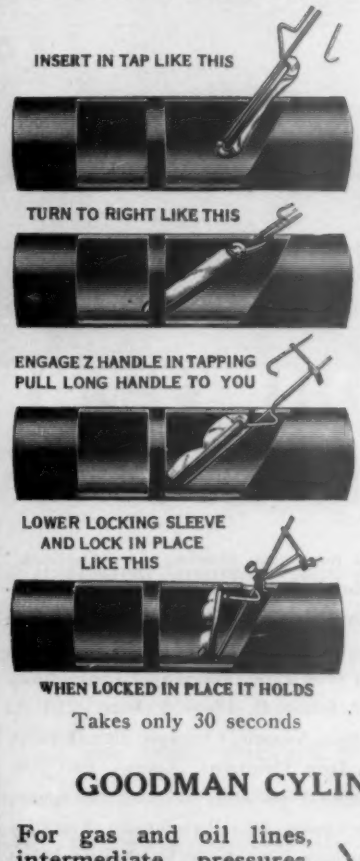
STREET DE
SUPPLIES - PI

GOODMAN *IMPROVED*
GAS MAIN STOPPER

Used Since 1897

Patented and Patents Pending

HOW TO USE THE GOODMAN STOPPER


INSERT IN TAP LIKE THIS
TURN TO RIGHT LIKE THIS
ENGAGE Z HANDLE IN TAPPING
PULL LONG HANDLE TO YOU
LOWER LOCKING SLEEVE
AND LOCK IN PLACE
LIKE THIS
WHEN LOCKED IN PLACE IT HOLDS

Takes only 30 seconds

With improvements added from time to time, now has as its newest feature the "Z" Handle for easier manipulation.

The Locking Sleeve (shown in detail above) holds the Stopper firmly in place.

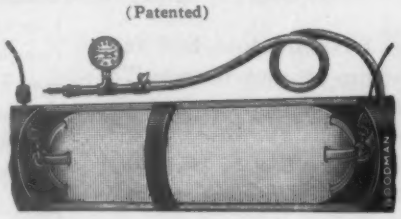
The new patented cross bar which backs up diaphragm and prevents "bellying" can be used on sizes from 10" upward.

LOOK FOR THE NAME
"GOODMAN"

GOODMAN CYLINDRICAL STOPPER

(Patented)

For gas and oil lines, intermediate pressures. This stopper is pulled into place by cables. To place and inflate requires less than one minute. Increased length for increased pressure.



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Respirators	Soap Tape
Calking Tools	Service Testers
Packings	Mittens and Gloves
Signal Stands	Danger Flags
Pumps	Joint Runners

Pressure Gauges,
portable and stationary

Service Plugs — Gas Main Plugs

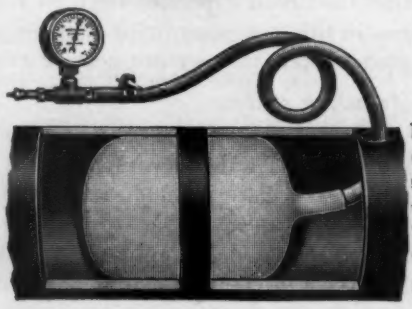
REPRESENTATIVES

C. B. Babcock Co.,
San Francisco, Cal.
Eastern Service Co.
Boston Mass.

COMPANY MEMBER OF AMERICAN GAS ASSOCIATION

DEPENDABLE GAS MAIN BAGS

Made in three types:
Light—Type "A"
Medium—Type "B"
Extra Heavy—Type "D"
Plain Rubber



TYPE "C" CANVAS COVERED

For use wherever a plain rubber bag will not hold. The canvas is treated to resist oil.

1897

SAFETY GAS MA

Established 30 Years - 523 ATLANTIC AVE

PARTMENT PE GANG TOOLS

INFLATING BULB

An inflating bulb is better than lung power for inflating gas main bags. Suitable for bags up to 8".

SOFT WOOD PLUGS

TYPE C

TYPE "C"
from 2" to 9"

TYPE "D"
From 9" to 48"
carried in stock

PIPE CLEANING BRUSHES

Made from Bassine and fine wire, properly proportioned. The wire scrapes, the Bassine sweeps the pipe clean. Sizes from 3" to 24".

GAS BAG PUMPS

SIZES

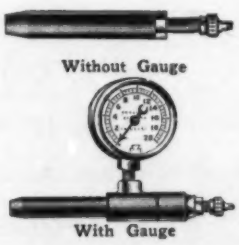
1½ x 12 inches, Pressure Only
2 x 18 inches, Pressure Only
2½ x 20 inches, Pressure Only
4 x 20 inches
4 x 20 inches, Pressure and Vacuum

HIGH PRESSURE SERVICE CLEANER

Be Sure To See Our Exhibit
BOOTH 110

GAS BAG VALVE
With or Without Gauge

Use a Valve for Easy Inflation and Quick Deflation



Without Gauge

With Gauge

We advise the use of a gauge showing the internal pressure in the bag. It prevents over-inflation and shows that the bag is holding.

AIR LINE MASK

Mask and Blower in Separate Carrying Cases

Blower will supply sufficient air for four masks.

GAS SAMPLING BAG

Capacity from 1 liter (0.035 cu. ft.) to 25 cu. ft.

KRUPA-HENDRY TEST CAP

Patent Pending

Consists of strong steel cap connected to coupling and secured on the pipe with set screws.

Used on open end when testing pipe for gas, oil or water.

IN STOPPER CO.
NUE BROOKLYN, N.Y. Cable Address Gastopper, N.Y.

1930

THE BARTLETT HAYWARD COMPANY

Main Office and Works
Baltimore, Md.

Lincoln Bldg.
New York City

DESIGNERS AND BUILDERS OF

Complete Coal Gas Plants

Carburetted Water Gas Plants

Blue Water Gas Plants

Oil Gas Plants

By-Product Plants

De Brouwer Charging and Discharging Machines

Salt Water and Fresh Water Condensers

Tar Extractors

Purifiers

B. H. Co. Vertical Centrifugal Scrubbers
(Feld Type)

B. H. Co. Thickener
(Genter Type)

Steel Tanks

Vertical Waste Heat Boilers

B. H. Co. Westling Valve
(Patent Applied For)

Fast's Flexible Couplings

GAS HOLDERS

THE BARTLETT HAYWARD COMPANY'S MAIN PLANT

AMERICAN
GAS JOURNAL
Established 1859 Pioneer of the Gas Industry
Including GAS INDUSTRY Est. 1900.

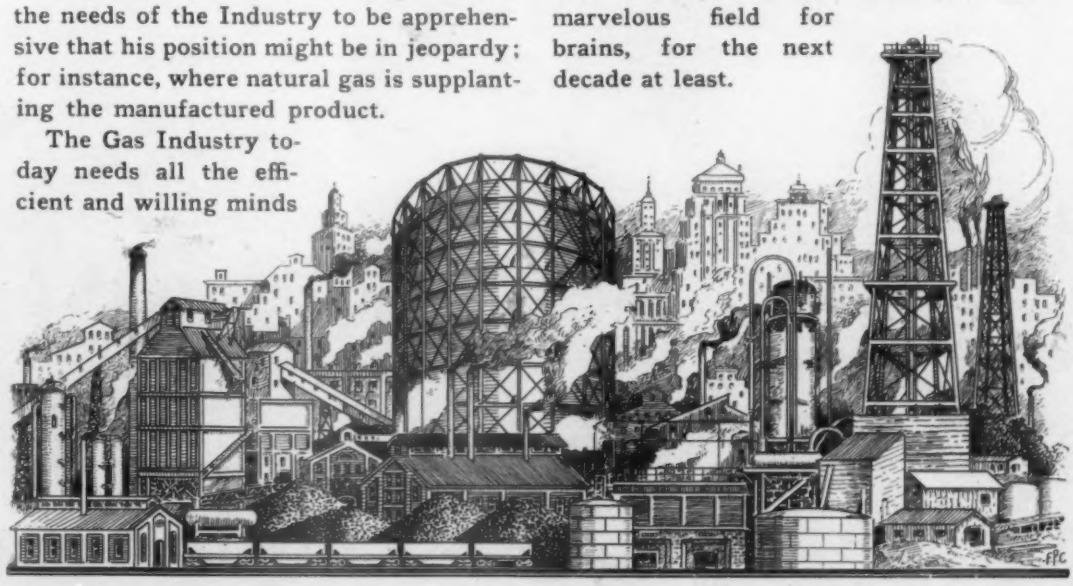
HENRY M. RILEY, *Editor*

The Flood Tide of Opportunity

MERELY A CASUAL SURVEY of the Atlantic City Convention program will amply serve to emphasize that the Gas Industry is undergoing changes that are not only tremendous in scope but vital as well. Clearly, these changes bring in their wake an altogether amazing number of problems whose solution must be both accurate and consummated without delay. Machinery and mechanization will assist greatly in such endeavor but, after all, the keenness of the Industry's brain power will largely determine the degree of success attained in bridging over during the present period of transition. In view of such a situation it would seem ridiculous for anyone of ability who is cognizant of the needs of the Industry to be apprehensive that his position might be in jeopardy; for instance, where natural gas is supplanting the manufactured product.

The Gas Industry today needs all the efficient and willing minds it can muster, not that it does not already have a goodly share of the same, but because the problems, if anything, are increasing at a greater rate than the facilities for their solution. Such being the case, opportunity is not knocking at the door of the Industry's employees, it has already passed the threshold and literally stands begging to be made at home and for a chance to help out.

Not so long ago many companies planned ahead for a certain number of years; now, this time must at least be doubled and employees who can accurately chart their course accordingly will be nothing short of indispensable to their respective organizations. Truly, the Gas Industry offers a marvelous field for brains, for the next decade at least.



Gas Transmission Dons Seven-League Boots

THE growth in the number of long distance pipe lines for transmitting natural gas from the fields to the points of ultimate consumption might have read in the not too distant past, like a tale from Gulliver or Munchausen. Almost over night the industry has become "distant conscious," so that we are no longer even mildly amazed to hear that a line is under way to a destination hundreds of miles from the gas wells.

While this long distance transmission of gas has been confined for the most part to natural gas undertakings, manufactured gas is being pushed further afield to serve communities relatively remote from the plant.

With this new activity have come many problems of a construction nature and otherwise which have yielded to the intelligence and ingenuity of the gas engineer. Thus, protection of pipe against corrosion, proper jointing to prevent leakage, spanning rivers and tunneling through hills have all been successfully handled on a scale that is nothing short of prodigious. Meanwhile, these engineering accomplishments have added much valuable lore to the distribution end of the industry. And in this connection, the manufactured and natural gas men have profited alike.

The accompanying illustrations, depicting various phases of the work on the line to San Francisco, will serve to give some idea of the difficulties encountered and the work involved in running a long distance natural gas transmission line.

At the top on page 38 is shown a relatively difficult river crossing. Here four eight inch, extra heavy pipes negotiate the San Joaquin River near Stockton, California. In the center of the page can be seen a twenty-two inch line wending its tortuous way across a hill. It will be noted how the twisting and turning, so to speak, have been facilitated by means of expansion

joints or couplings, a device of prime necessity to the long distance transmission engineer.

In the lower left is shown a twenty inch line being lowered by means of a huge portable crane, while to the right lengths of twenty-two inch pipe are being nudged into alignment by means of two caterpillar tractors. These jobs amply demonstrate the value of mechanical equipment in carrying on.

As the pipe is finally laid large quantities of earth must be backfilled over it and here again the caterpillar comes to the rescue hooked up with a bulldozer. The upper left picture, page 39, shows this equipment tire-

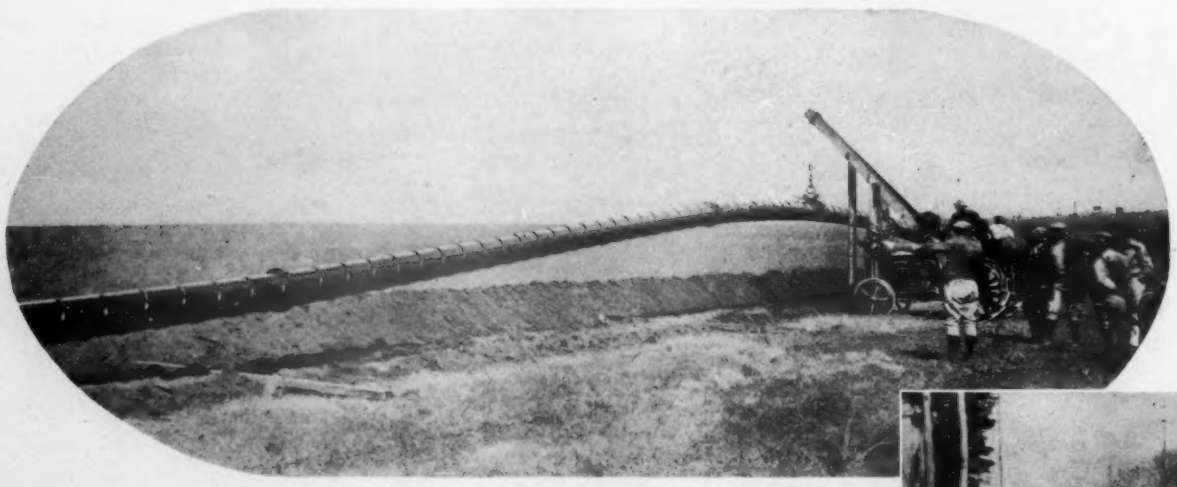
lessly pushing in place the cover of earth and one is reminded of the arduous toil exacted from men with pick and shovel doing a similar task when the railroad was being built through the self-same country some fifty years ago.

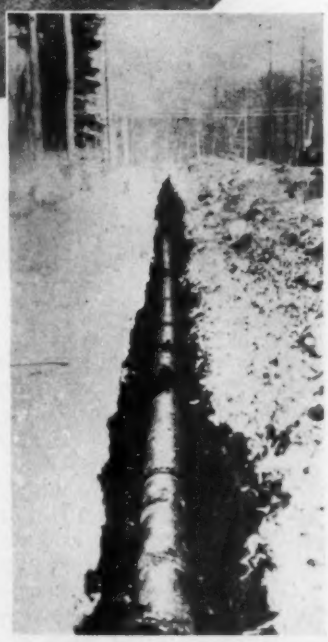
At the right is illustrated a method of jointing the pipe by means of the electric welding method. In this particular instance one bell has been cut off in order to permit an angle to be made. Incidentally, welding, whether electric or oxy-acetylene, plays an extremely important role in running long gas lines.

The crossing at Cosumnes River, between Stockton and Sacramento, is shown in the lower left. In this case two sixteen inch lines span the river on piers or towers. The distance between these towers is three hundred and fifty feet. Here the engineer had to resort to bridge building tactics.

The lower right picture is another view of the San Joaquin River crossing.

Tightening Up on Pipe Problems

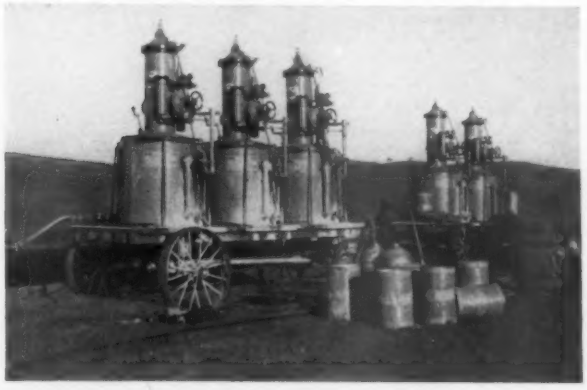




IN the quest for tighter and stronger gas lines distribution engineers and manufacturers have worked together in a manner that has produced splendid results. Indeed, it is a reasonable hazard that this end of the gas industry has shown greater progress than any other. It only pales in comparison with the operation of a huge compressor station or a gas manufacturing plant by reason of the fact that a strong, well joined pipe line is soon buried out of sight and performs its mission in silence.

When one considers the problems that have bedeviled the distribution engineers it can be realized that what these men have accomplished in conjunction with the coupling manufacturers and welding companies, in reducing unaccounted for gas to the vanishing point, has been truly monumental.

It is difficult for many of us to realize that our underground equipment is subject to considerable strain, due to vibrations, shifting ground, washouts, etc., in addition to the strain on the joints due to expansion and contraction of the



pipe. These hazards are particularly of importance in the case of long distance pipe lines, but in this connection as well as that of the piping within the city limits superior jointing methods have virtually eliminated leakage and the attendant expensive repair operations. Today then, it is not a question as to whether the distribution engineer can eliminate leakage and run a strong pipe line, but merely what jointing method he should select to suit the particular conditions.

The topmost illustration on page 40 shows the use of Victaulic Couplings on the pipe line of the Seaboard Gasoline Corporation in Texas. This line handles residue gas under approximately 40 pounds pressure. As the pipe is being lowered one can realize the strain on the same and the attendant necessity of having the joints both strong and gas tight.

In the middle right picture is shown a ten inch gas line being installed in the suburbs of New York City. In this case also, Victaulic Couplings were used to produce the required joints.

The longest large diameter gas main installation in the world is shown in the lower left illustration on page 40. This main which was recently laid in Chicago by the Peoples Gas Light and Coke Company, consists of 32 miles of 48 inch cast iron pipe through which upwards of one hundred million cubic feet of gas pass daily. Dresser Couplings were used on this job.

The lower right cut, page 40, shows the laying of the pipe line from the Louisiana fields to St. Louis. This line, where Dresser Couplings were also used, has an approximate length of 460 miles, a diameter of 22 inches, and a daily capacity of one hundred million cubic feet of gas.

A battery of Oxweld acetylene generators supplying acetylene to welders on the Pacific Gas and Electric Company line is shown in the upper left illustration on this page. In the upper right can be seen the barge used in laying an Oxwelded line across the Hudson River from Beacon to Newburgh for Central Hudson Gas & Electric Company. The pipe was welded and fed from the barge. The oval illustration gives a view of welders Oxwelding a pipe line on a barge on the Ohio River. This work was done for the Missouri-Kansas Pipe Line Company.

The two lower illustrations show the application of Lincoln electric welding to gas pipe lines. The right hand cut depicts a native operator making a firing line weld on the 145 mile, natural gas line between Monterrey, Mexico and Roma, Texas.

The Compressor Station---
Guarantor of Adequate Service

THE running of a natural gas transmission line from the field to the point of ultimate consumption does not in itself insure continuity and adequacy of service, even though the gas does enter the line at the field at very high pressure. What with the distance natural gas pipe lines are now being run, this initial high pressure would finally dribble down to so low a point that, figuratively speaking, the gas at the far end would make its exit at a rate scarcely sufficient to operate a handful of gas refrigerators.

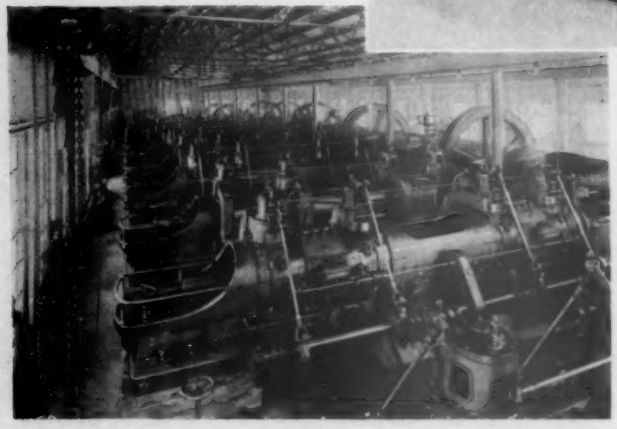
Often to maintain the proper pressure and rate of flow at the various points of consumption, compressor stations have to be introduced in the line. These correspond in effect to the holder and outlying booster stations in the manufactured gas end of the business. But, it must not be assumed that these compressor stations are simple affairs; to the contrary, they are many times complicated, from an engineering standpoint and their design and operation have been developed to a high state of perfection. Indeed, they are just about the last word in reliability. It is interesting to note that most compressor stations use gas for furnishing power to drive the units, the volume required per horsepower being quite low.

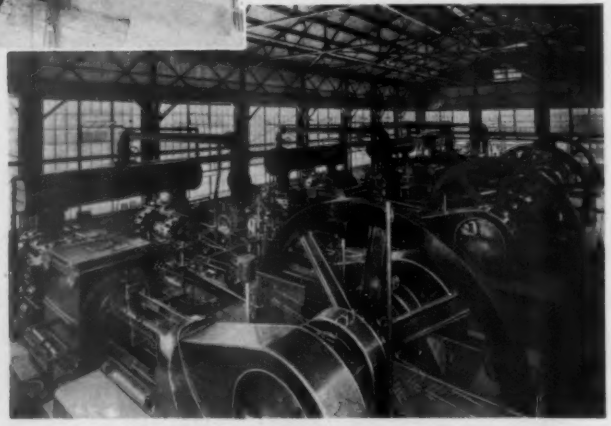
The man power necessary to operate even a very large compressor station is kept to a minimum by reason of the up-to-date design of the compressors and accessories and the many automatic, labor saving mechanisms.

Aside from the actual design and construction of a compressor station the selection of the proper site is by no means an elementary problem. A sufficient water supply for cooling and other purposes must be at hand and this feature often involves the drilling of artesian wells, particularly where the station is located off the beaten path. Railroad facilities must be studied and the location must be selected so as to afford proper living conditions for the operating force. Telephone and electric lines must be available, as well as similar services necessary for proper operating conditions.

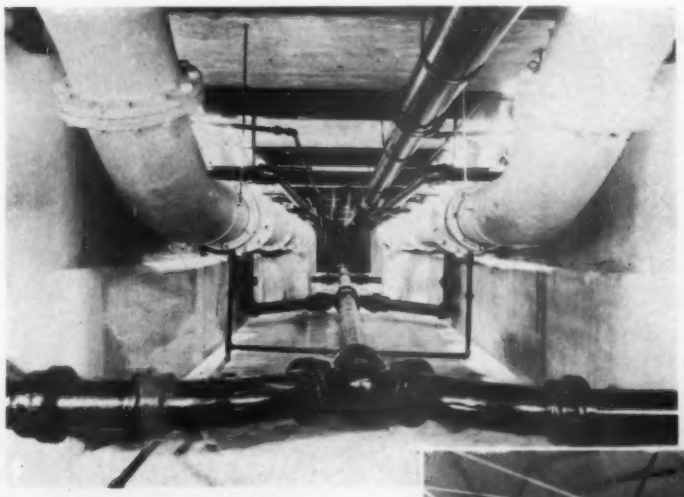
The upper picture on page 42 shows an exterior view of Compressor Station No. 40, Buena Vista Hills, a field near Taft, California. This station is operated by Southern California Gas Company. In the lower right, same page, is shown the interior of another station located at Los Angeles. This unit, also of Southern California Gas Company, has four 1000 horsepower, steam driven compressors.

The center picture gives a good idea of the size of Branchland Compressor Station of the Columbia Gas and Electric Company. Here are operated eight 21½ x 36 single tandem, 500 horsepower, Cooper gas engines, front connected to the compressor cylinders.





Three 21½ x 36 twin tandem, 1000 horsepower and three 21½ x 36 single tandem, 500 horsepower Cooper gas engines, front connected to the compressor cylinders are shown in the lower left. These are in the Spencer



Station of the United Fuel Gas Company.

These illustrations should well serve to emphasize the vastness and complexity of compressor stations in general, particularly to those men in the manufactured gas end of the business who might be somewhat unfamiliar with this phase of natural gas activity.

Perhaps the last word in compressor stations is the plant recently constructed by Ford, Bacon and Davis at Reform, Alabama. This unit is on the line of the Southern Natural Gas Corporation from the Louisiana fields to Birmingham and Atlanta. It has a capacity of 70,000,000 cubic feet of gas per day,

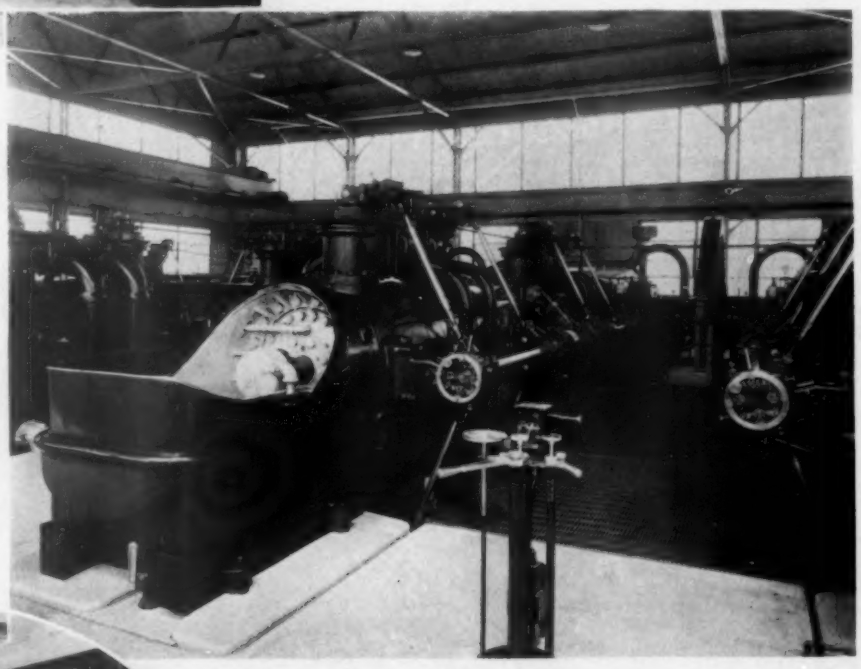
at a discharge pressure of 350 pounds per square inch. In this plant are five compressor units over fifty feet long and each having 1250 horsepower. They are Worthington make and are water cooled. Natural gas supplies the driving power. The middle illustration on this page shows a close up of one of these five compressor units.

At the top is shown some of the exhaust, water and oil piping in the Reform Station. The large light colored pipes at the top take care of the exhaust from the engine, the dark overhead pipe is part of the cooling water line, the dark piping at the bottom carries off the hot water, while the small piping is a part of the oiling system.

In the oval is shown a portion of the valve yard and the gas coolers. In this connection, attention is called to the general air of orderliness and cleanliness at the Reform Station, both inside and out. Such a condition makes for efficient operation and pleasant working conditions.

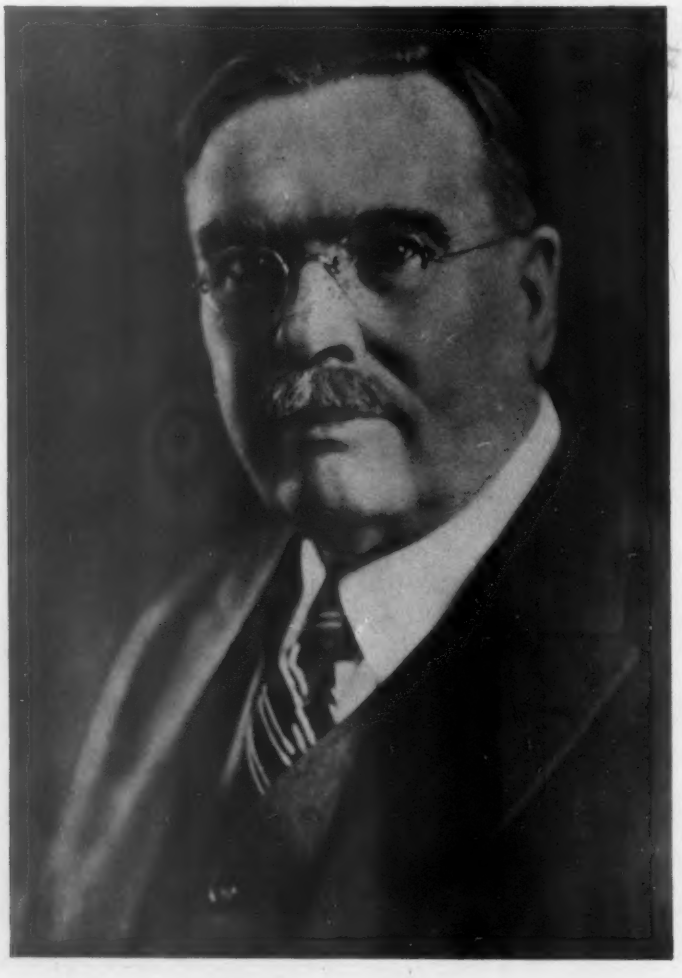
The water for this station is supplied from two artesian wells and has a temperature of about 65 degrees. In the meter house are located the Chaplin-Fulton Regulators and Westcott Orifice Meters.

The illustration in the lower right of this page shows an exterior view of the Bivins Compressor Station which is on the line from Amarillo, Texas to Denver, Colorado and located in the Amarillo gas



field at a point about thirty miles north of Amarillo. In the Bivins Station are housed three compressor units, 22 x 36 x 15¼, twin tandem horizontal, 4 cycle, Worthington gas engine driven, 1000 hoursepower. The normal operating pressures are as follows: 190 pounds suction and 325 pounds discharge. The capacity of the units is 33,000,000 cubic feet each per 24 hours at normal operating pressures. In addition to the Bivins Station, there are three other compressor stations on this line.

THE INDUSTRY STRIDES FORWARD



Bernard J. Mullaney
President, American Gas Association

THE American Gas Association and the Gas Industry itself are so intimately interlocked that the progress made by one element of this partnership is a direct measure of that attained by the other. Hence, when it is said that the Association has witnessed a year of outstanding achievement during President Mullaney's regime we can be reasonably sure that the Gas Industry in turn has stepped forward in no unfaltering way.

What with the comprehensive programs of education, research and the like that have now definitely passed the trial stage and are accepted procedure in American Gas Association activities the Gas Industry presses on toward continuing and well merited success. As might be deduced from the scope of the present Convention, the Gas Industry and American Gas Association have during the past year gathered up many loose ends and our aims now form a rather well knit fabric of endeavor. In a sense, then, it has been a year of team work and as a captain, President Mullaney has furnished leadership of a very high order. The Industry strides forward and the closing administration is entitled to much credit for such progress.

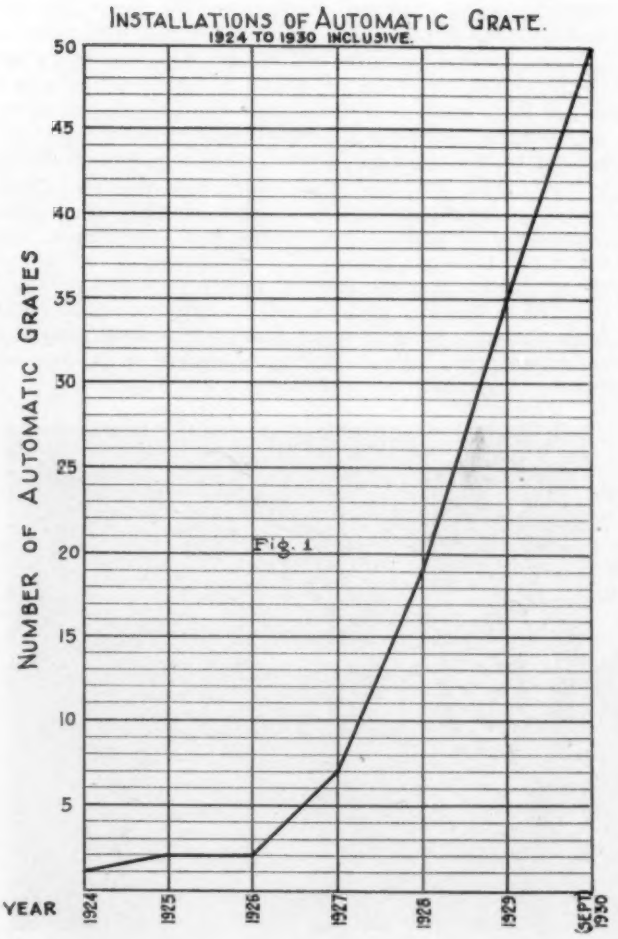
The Mechanical Grate

JOHN H. WOLFE

Superintendent, Gas Manufacturing, Consolidated Gas Electric Light & Power Co., Baltimore, Md.

NO development in recent years has been as heartily welcomed by the gas manufacturer as the automatic or mechanical grate. This article will treat only of the ash removing or self clinkering portion of the generator of a water gas set, and not of the automatic generator, which implies complete automatization of the generator and as such includes automatic charging of the fuel, as well as the removal of ash.

A brief review of the number of machines in operation annually in America will be of interest. In 1924 there was one and in 1925 there were but two. Operation of these was studied for several years, and by 1927 real growth was represented, at which time there were a total of seven sets in operation. By 1928 this number had grown to nineteen, and by 1929 to thirty-five. At present there are fifteen more on order and under construction, which will bring the grand total to fifty. This growth is shown graphically in Figure No. 1.



The chief reason for this popularity is that the mechanical grate has removed the dirtiest, most laborious, and hottest job that the gas man has ever had to face,

Fig. 2. Hand Cleaning Operations, Baltimore. Removing Bottom Clinker

namely, that of clinkering a water gas set. This work involved not only the removal of the bottom clinker, but also of the firmly adhering, and tenacious side wall clinker. Such operations as are depicted in Figures No. 2 and No. 3 were difficult even when partly mechanized and are familiar to every gas man.

In handling this difficult assignment the mechanical grate has brought about such an improvement in plant appearance and working conditions, due to practically complete elimination of dust, dirt, heat, and steam that one who has worked only under the old hand clinkered operating system cannot appreciate the tremendous improvement until he has actually experienced it.

In addition to these physical drawbacks to hand operation, there were others which years ago were accepted as a matter of fact, such as:

(1) Loss of productive time and, therefore, productive capacity on the machine during the clinkering period. Under bad fuel conditions this might amount to as much as six hours out of twenty-four, or 25% lost time.

(2) Poor operating results, because of non-uniform fire conditions. If the fire could have been maintained in the condition which obtained just after a clean, all would have been well, but ash and clinker began to accumulate as time elapsed until finally the ash bed exceeded the active fuel bed in thickness, and such a high resistance had been interposed to the flow of air and steam, that the capacity obtained per run dropped off rapidly and progressively. Chemically, the conditions were all wrong, because of the fact that with the clean fire there was a tendency for the set to take air and steam too freely and thus overheat locally with resulting

blow holes or channels, while with the dirty fire the fuel bed was so thin that a poor quality gas, high in CO_2, was the inevitable result. A further result of this poor chemical balance in the generator was reflected in a distorted heat balance in the carburettor and superheater, the oil fixing and cracking chambers, because the generator gas on the blast just after a clean was high in B.t.u. content, while just before a clean it was of poor quality and often insufficient to fill the heat requirements. This penalized oil results in two ways, first, apparently, because the blue gas quality was decreasing in value between cleans, whereas usually a constant value was attributed to this gas, and second, actually, because of the wide variation in heat input from the generator to the carburettor and superheater as compared with the demand.

Fig. 3. Hand Cleaning Operations, Baltimore. Removing Side Wall Clinker with Motor Driven Barring Down Machine

(3) High operating labor charges, because it was impossible to work the clinkering labor efficiently, nor could the excess or standby time of these men be utilized and dovetailed into the other plant operations smoothly. The greater the fluctuation in gas production the more difficult the latter problem because it was accentuated.

Development

Although the need had long been recognized, and many sporadic attempts had been made to fill this need, no definite progress was made on the problem until about 1924. Since then gas operators have evidenced a willingness to work with the equipment designer and manufacturer, with the result that real progress has been made. This always happens when wholehearted cooperation exists.

The units which will be marketed in future years will be immeasurably better than the original units, because actual operating experience has been built into them. This portion can be contributed only by the operator. A unit which will work satisfactorily in one plant may have definite limitations when applied at another and the all around, useful, successful machine must be able to meet all conditions as they arise.

Design

This brings us to the point of outlining the characteristics of the ideal mechanical grate. In the writer's experience the following are necessary:

First—it should operate continuously, that is—it should remove all clinker and ash without interruption twenty-four hours a day, seven days a week, for at least four to eight weeks. To accomplish this, the design must be correct in that, (a), the requisite ruggedness must be inherent in the shock resisting and wearing parts. No more severe conditions can be encountered by any machine than exist in the generator of a water set embodying as they do high temperatures, severe abrasive conditions because of the emery-like qualities of the coke and ash, and the unusually corrosive atmospheres which contain alternately oxygen, sulphur and a high percentage of moisture. The latter will bring out all of the inherently bad acid properties of the fuel and ash. (b) Proper and generous provision must have been made for lubricating and minimizing wear on all moving parts. (c) Quickly worn portions of the equipment must be readily accessible for replacement.

Fig. 4. A.B.C. Automatic Grates—Spring Gardens Stations, Consolidated Gas Elec. Light & Power Co., Baltimore. Completed view of three of four generators

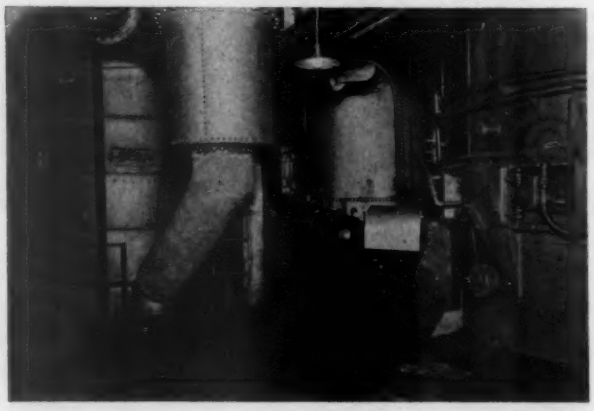


Fig. 5. A.B.C. Automatic Grate—Spring Gardens Station, Consolidated Gas Elec. Light & Power Co., Baltimore. View showing Drive. Motor is located under hood to right of center

Second—The grate should operate in such a manner as to deliver the greatest amount of gas in a given unit of time, and that with a minimum usage of fuel and oil. Briefly, it must deliver generous capacities, and that with minimum fuel consumption.

Third—The equipment must be so arranged as to facilitate hand cleaning and repair, so that it will be out of commission the shortest possible length of time if an operating emergency arises.

Available Types

At the present time there are two mechanical grates which have both been through an extensive development period. Both of these units will perform the func-

tion of removing ashes and clinker, and, in the writer's opinion, both will do a good job of it. These machines are.the A. B. C. Mechanical Grate, as built by the Western Gas Construction Company of Fort Wayne, Indiana, (see Figures No. 4 and No. 5) and the Haug or U. G. I. Mechanical Generator, as sold by the United Engineers and Constructors, Inc., of Philadelphia, Pa. (see Figures No. 6 and No. 7).

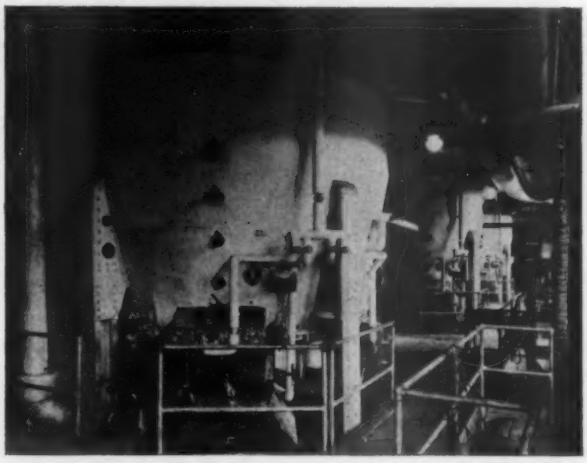


Fig. 6. U.G.I. Mechanical Generators—Station "B" Philadelphia Gas Works. Completed view of three Generators

The relative advantages and disadvantages of these two units, as at present constructed, and according to the writer's experience and observation, may be characterized as follows:

A. B. C. Mechanical Grate

(a) Advantages
(1) Easily installed on existing generator. Installation shown on Figure No. 4 was made on old generators.
(2) Requires low head room below clinkering floor for ash removal mechanism. This is illustrated in Figure No. 8 which shows a 1 cu. yd. 40" high ash car in position to receive ashes.
(3) Needs very small quantities of water as coolant for the beam when installed with dry walls, with resultant small heat loss from this source.
(4) Produces no steam. This is an advantage in many plants.
(5) Almost all parts are readily accesible and easily repairable.
(6) Ample provision has been made by means of large access doors for quickly cleaning the fire by hand in the event of a breakdown to the automatic grate.

(b) Disadvantages
(1) Operations must be controlled somewhat more closely to prevent side wall formation with dry wall construction. This may not actually be a disadvantage. One may rightfully ask, why not control all of the essentials contributing to generator operation, so that maximum economy may be secured at all times.

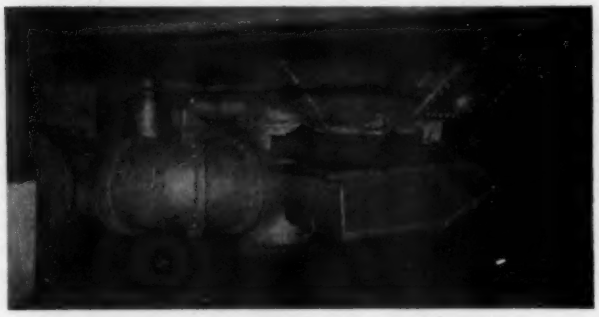


Fig. 8. A.B.C. Automatic Grate, Spring Gardens Station, Baltimore. View showing Bottom Gas Connections and Ash Removal Mechanism. Ash Car shown is of one cubic yard capacity

(2) Portions of this equipment are rather too light in construction to assure low maintenance costs. Also, some of the moving parts are exposed to dust and heat conditions, and, in addition, are inaccessible and difficult to lubricate. Steps are being taken to overcome these defects.

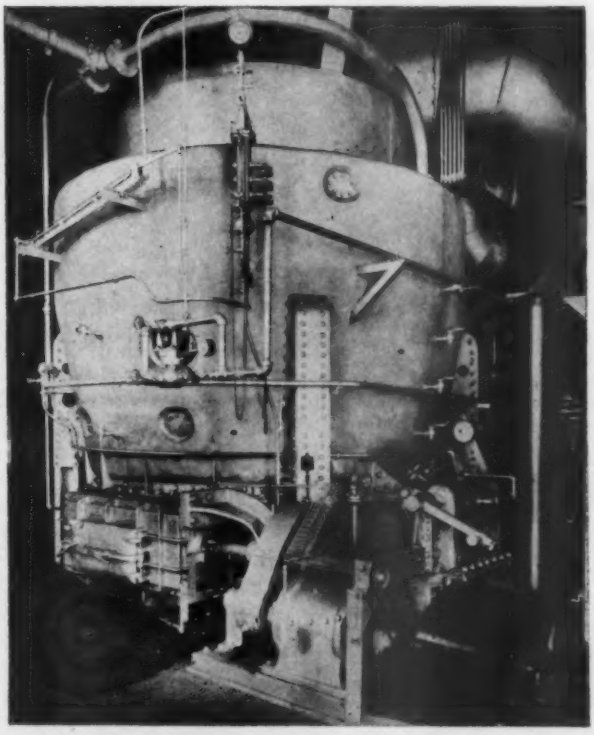


Fig. 7. U.G.I. Mechanical Generator, Chester, Pa. Completed view of one Generator—Driving Side

Haug or U. G. I. Grate

(a) Advantages
(1) Not sensitive to large changes in operating conditions because of large wall cooling surface embodied in low pressure boiler or water jacket.
(2) Rugged in construction with ready access to all moving parts. See Figure No. 9, which shows drive exposed. While units are somewhat too new to predict maintenance costs accurately, preliminary experience seems to indicate a low cost in this regard.
(3) Produces process or low pressure steam as a by-product in operation. This may be a disadvantage in plants having a perfect steam balance.

(b) Disadvantages
(1) Requires replacement of entire generator, due to water jacket.
(2) Ash gates, and particularly double gates, require considerable head room and somewhat more floor space. This can be provided for

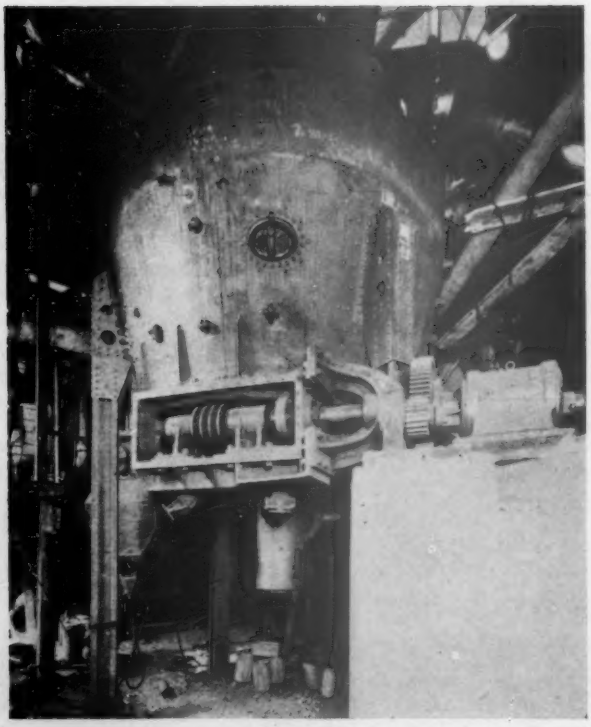


Fig. 9. U.G.I. Mechanical Generator—Station "B" Philadelphia Gas Works. Construction view showing height under generator and sturdy Worm Drive

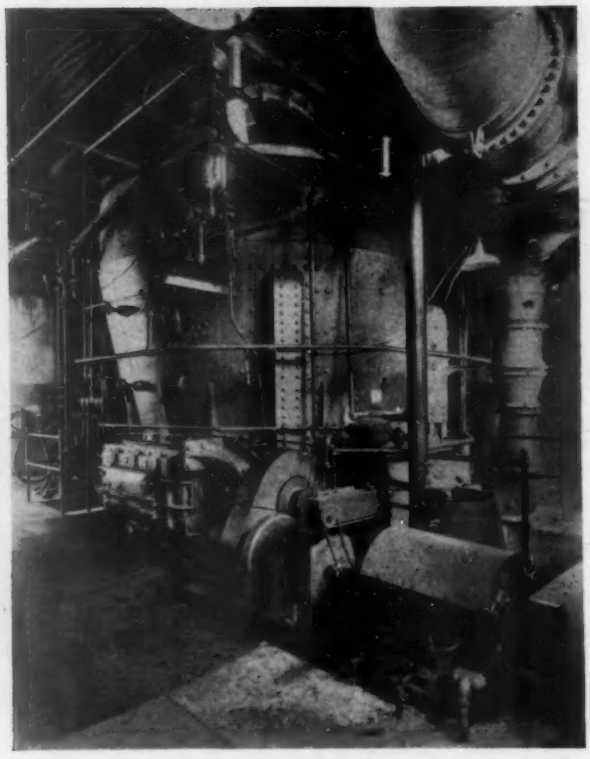


Fig. 10. U.G.I. Mechanical Generator, Camden, N. J. View showing Driving Side. Motor is under hood in foreground

on new installations, but is difficult to take care of in existing plants with low set or flat bottom generators. See height required as illustrated in Figure No. 9 and floor space as shown in Figure No. 10.

(3) Requires a considerable quantity of water of good quality for steam raising (water jacket cooling) purposes.

(4) No provision has been made for quickly cleaning fire in case of a breakdown in operation.

The capacities obtainable with either unit are high and are comparable when considering the same sizes. From all reports the percentage of carbon lost in the ash will fluctuate between fifteen and twenty-five percent, depending on the fuel characteristics and local operating conditions.

(*Continued in an early issue.*)

Unique Experiment In Gas Storage

THE East Ohio Gas Co's., regulator plant at Ravenna, Ohio, was recently the scene of a rather unique experiment in gas storage.

Two 35,000 cubic foot, racing balloons, anchored in a field near the regulator plant, furnished the Ravenna gas supply for two hours while a changeover was made to new gas mains in the city.

The two balloons were made fast and filled with gas from the mains on a Sunday morning, during a period of light demand.

By 2 o'clock p. m. the bags had been filled and workmen were ready to cut over from the old to new mains. Compressors were started in the regulator plant to keep an even flow of gas in the city mains.

It took two hours to complete the cutover, during which Ravenna drew its gas supply from the racing balloons. When the cutover was finished, the remaining gas in the bags was pumped back into the mains.

Gas Sales Up

REASSURED by gas and electric sales, Wisconsin business during the first half of 1930 exceeded the same period of the year before, according to John N. Cadby, executive secretary of the Wisconsin Utilities association. Domestic sales of gas show a healthy increase, with nearly all companies reporting total sales better than the last ten year average and in some cases even better than the high peak set in 1929, a banner year. Gas in being used more and more in industry as well as in homes, where it is used in larger and larger quantities for cooking, heating and refrigeration. Sales of Electrolux refrigerators are climbing steadily, the fact that it costs little, is noiseless, and there are no moving parts having a great deal to do with increasing buying. Large apartment house installations have recently been made in Milwaukee by the Milwaukee Gas Light Co. of Electrolux units.

Potential Field for the Utilization of Liquefied Petroleum Gases

O. M. SETRUM AND L. H. WRIGHT,
Philfuels Company

THE chief problem in gas utilization has not been the manufacture or production of gas, but rather its distribution to the ultimate consumer. Due to the physical characteristics of gas, its distribution has in many ways been more difficult than that of other fuels. A pound of coal or a gallon of fuel oil can, in most cases, be delivered to the ultimate consumer more readily than can a cubic foot of gas. The gas industry has been faced with the necessity of vast expenditures for transmission and distribution systems in order to distribute its product to the consumer. This fact is strikingly shown when we consider that the average investment of the gas industry per dollar of annual gross revenue is $5.90.

Despite the fact that transmission lines for both manufactured and natural gas are being constantly extended, there still remains a large field for extension of gas service. In many instances, it is not feasible to build transmission lines to reach distant communities, the cost of these lines making the price of gas prohibitive. The manufacture of gas at small properties by the conventional methods of manufacture has not always been attended with financial success. Then there is also the field consisting of homes so scattered and remote that any attempt of gas distribution by the conventional methods of pipe line distribution is entirely out of the question.

An Altered Situation

The recent advent of liquefied petroleum gases in commercial quantities and their successful utilization in the gas industry has altered this situation and uncovered potential fields that heretofore have not been seriously considered. The purpose of this paper is to present in brief form a survey of this field. It is realized that a survey of this kind at the best is not absolutely accurate and, due to the development in the gas industry, these figures will not be stationary.

The utilization of the liquefied petroleum hydrocarbons, commercial butane and propane, can be divided into three groups, based upon the methods of distribution and the physical properties of the gases:

(*a*) *Bottled Gases.* In this system undiluted propane, used because it is self vaporizing at all temperatures above –44° F., is distributed in individual cylinders or by tank truck to the consumer's home. In many areas in which this gas is available, a system has been set up in which, as far as the customer is concerned, the service is the same as that rendered by a city gas company; by weighing and refilling the storage cylinders each month, the distributing company is able to submit a monthly gas bill to each customer, who has never to order fuel or manipulate equipment. This type of gas service has already experienced a quite rapid growth and an increase in 1930 of 100% over the 55,000 customers served in 1929 is anticipated.

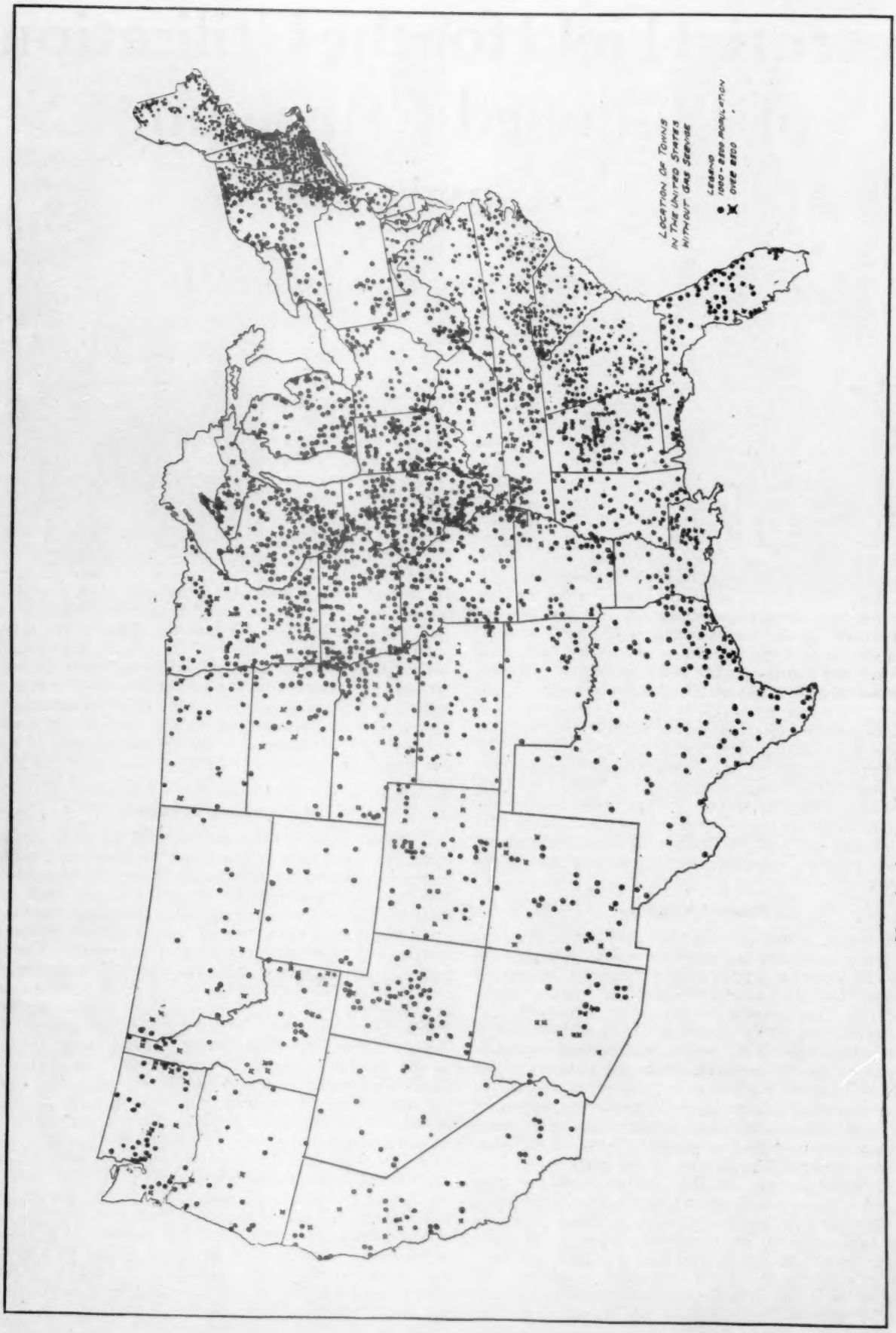
(*b*) *Distribution of Undiluted Propane Vapor Through Pipe Lines.* This type of service is especially adaptable to communities in which the number of customers is concentrated and yet too few in number to justify the installation of a plant such as that to be discussed later in this article, and at the same time, so far distant from a source of either natural or manufactured gas supply that it would be uneconomical to install transmission lines. It constitutes piping the undiluted propane vapor (2550 B. T. U. per cu. ft.) directly from the vapor space of the liquid storage tank through pressure regulators into a pipe line distribution system leading to the consumers' services. This is practically equivalent to a natural gas well at the property and possesses the advantage that the potential supply of gas can always be maintained by tank car shipments of propane.

Influencing Factors

The low capital investment required for plant equipment, the elimination of practically all power and maintenance costs, and the reduction of labor cost to a minimum makes this method a very practical one when the total number of customers and daily sendout is limited.

At the present time, two of these undiluted propane systems are under construction and several utility companies are planning installations in the near future. Somewhat similar systems are in use at the present time in California and a large construction program on the Pacific Coast has been outlined for the coming year.

(*c*) *Butane-Air Carburetion.* This process, known as the Philfuels process of gas manufacture, has undoubtedly created more widespread interest among executives, managers, engineers and operators in the gas industry than any other phase of the utilization of the liquefied petroleum gases. It consists essentially of diluting the high calorific value butane vapor with air or some other noncombustible gas until a mixture having the desired thermal value, usually 530 B.T.U. per cu. ft. is obtained; the gas is then distributed through mains in the conventional manner. The method of dilution or mixing, most generally employed is that of a positive proportioning device employing a variable orifice with a fixed differential. This method of proportioning has the advantage of low initial investment, positive action, satisfactory results under variable load, low main-



Map showing location of towns in the United States without Gas Service

tenance, and adaptability to either high or low pressure distribution. The plant equipment necessary in addition to the proportioning device includes a butane storage tank, a vaporizing unit for vaporizing the liquid butane, a blower or compressor, a gas storage tank and a station meter. The cost of this equipment is sufficiently low that the fixed charges do not make gas costs excessive for low sendouts, as is the case with small coal and water gas plants. Since a profitable return on the necessary investment is possible with a load of three hundred customers, these plants offer very attractive possibilities in towns of over 2500 population.

The number of plants of this kind now in operation east of the Rocky Mountains is twenty-seven, with some twenty more now under construction. There has also been considerable activity in this field in California and the installation of a number of these plants on the west coast is contemplated.

A Very Large Field

The field for expansion in the utilization of these gas plants is a very large one. One authority estimates that at the present time in the United States, the various fuels for domestic purposes are divided as follows:

15,500,000 families using gas
7,700,000 families using wood and coal
6,500,000 families using oil and kerosene
1,000,000 families using electricity
55,000 families using bottled gas

There are, according to these figures, some 14,200,000 users of coal, wood and oil that should be potential users of gas; of course, the locations of many of these are so remote that it will be impossible to furnish them with bottled gas service, but to a large percentage this service will be available. In an attempt to survey the potential field for butane gas and undiluted propane distribution through pipe lines, the latest available statistics were taken in making a survey of the towns of over 1000 population without gas service. Two lists were made; one of towns whose populations were between 1000 and 2500, and the second of those having over 2500 inhabitants. In the smaller communities undiluted propane would undoubtedly be the more feasible, while the larger towns would justify butane plants. The data obtained shows that there are 2423 towns of between 1000 and 2500, and 667 towns of over 2500 population without gas service.

Towns not having gas service which have granted gas franchises within the last three months were not included in this list. The census figures used in most instances were 1920, as the 1930 figures were not available, hence this estimate is a conservative one.

	TOWNS OF 1000-2500 POPULATION			TOWNS OF OVER 2500 POPULATION		
State	No. of Towns	Total Population	Average Population	No. of Towns	Total Population	Average Population
Alabama	65	98,731	1,495	30	105,581	3,519
Arizona	13	19,223	1,479	9	31,991	3,554
Arkansas	44	68,579	1,524	11	39,347	3,577
California	37	56,423	1,525	8	28,063	3,508
Colorado	39	55,925	1,436	8	28,472	3,559
Connecticut	52	79,729	1,523	29	133,426	4,600
Delaware	3	3,941	1,314	1	2,703	2,703
Florida	61	93,557	1,534	21	80,285	3,823
Georgia	84	128,352	1,528	30	127,155	4,238
Idaho	23	33,304	1,448	15	68,916	4,594
Illinois	160	249,280	1,558	35	119,700	3,420
Indiana	90	131,197	1,458	18	59,943	3,330
Iowa	112	169,643	1,506	16	52,560	3,285
Kansas	39	60,255	1,545	9	33,543	3,727
Kentucky	38	54,499	1,434	15	48,258	3,217
Louisiana	26	37,440	1,440	11	45,344	4,122
Maine	124	183,024	1,476	28	124,320	4,440
Maryland	15	20,205	1,347	1	3,905	3,905
Massachusetts	71	112,684	1,587	26	99,746	3,836
Michigan	101	147,092	1,456	15	55,798	3,719
Minnesota	91	140,994	1,549	28	104,603	3,736
Mississippi	47	68,479	1,457	12	51,162	4,263
Missouri	102	162,792	1,596	19	64,875	3,414
Montana	18	26,911	1,495	6	25,066	4,177
Nebraska	56	83,720	1,495	9	26,103	2,900
Nevada	11	19,033	1,730	1	4,144	4,144
N. Hampshire	58	89,507	1,543	14	46,171	3,298
New Jersey	26	38,092	1,465	7	19,792	2,827
New Mexico	25	36,746	1,470	9	34,793	3,865
New York	82	125,395	1,529	22	71,069	3,230
No. Carolina	82	117,306	1,430	26	91,842	3,533
No. Dakota	22	28,824	1,310	6	18,706	3,117
Ohio	58	78,295	1,424	..	.....	....
Oklahoma	20	31,222	1,561	3	9,556	3,185
Oregon	19	30,112	1,585	3	12,893	4,297
Pennsylvania	20	28,065	1,403	8	29,879	3,735
Rhode Island	20	30,848	1,542	13	56,368	4,336
So. Carolina	59	97,161	1,647	29	116,405	4,014
So. Dakota	25	33,782	1,351	7	25,420	3,631
Tennessee	49	72,912	1,488	27	93,767	3,473
Texas	89	129,851	1,459	17	64,608	3,800
Utah	41	59,532	1,542	8	26,722	3,340
Vermont	61	86,944	1,425	8	32,575	4,072
Virginia	45	66,465	1,477	14	50,231	3,588
Washington	34	63,448	1,442	12	47,496	3,958
W. Virginia	33	42,735	1,295	6	24,200	4,033
Wisconsin	77	116,197	1,509	26	103,090	3,965
Wyoming	12	18,811	1,573	..	.....	....
Total	2,423	3,727,262	1,538	667	2,540,592	3,809

If we assume a saturation of 1 gas service per each 7 population, the potential number of customers available in these town is 895,408, a number practically equivalent to 5.75% of the total number of gas users at the present time. Assuming that the average customer used 30 M cu. ft. per year, it will mean an increased load of approximately 27 billion cu. ft., and a gross annual revenue at $1.50 per M, or over 40 million dollars. In many of these towns, it will be more economical to furnish manufactured or natural gas than to utilize these liquefied gases. However, in any event, there will be a large number where the cost of transmission lines will prove uneconomical, and we can look forward to an increasing number of these plants.

Appliance Possibilities

The attractiveness of this field is not limited to the gas utility companies alone, but extends to the manufacturers of appliances as well. Each prospective gas customer is a prospect for gas ranges, water heaters, space heaters and other gas appliances. If we assume an investment of only $100.00 per customer, it means an expenditure of nearly 90 million dollars. This population of 6,267,854 living in towns of over 1000, if we take for granted that the average family consists of 5, accounts for 1,253,000 of the 14,200,000 users of coal, wood and oil, which leaves nearly 13 million potential bottled gas users. A large number of these are too scattered to be economically reached by the present methods of distribution. What the possible saturation will be is hard to estimate, due to the age of the bottled gas industry. If we assume that one family in ten will finally have gas service of this kind, it represents a potential field of 1,300,000 users.

To summarize, the liquefied petroleum gases open up a large and profitable field that heretofore we have been prone to consider inaccessible, as well as unprofitable. That the gas industry as a whole is becoming aware of this opportunity is evidenced by its activities during the past year.

Erratum

On page 44, line 16, July 1930 issue, *American Gas Journal*, there appeared the following:

"In Dallas, Houston and Fort Worth, Texas, the use of natural gas for domestic and commercial heating is well nigh universal, with gas selling at about 5 cents per 1,000 cubic feet for this purpose."

This should have read: ". . . . . with gas selling at about 65 cents per 1000 cubic feet for this purpose."

Gas Mixing Control at Windsor Ontario

GEORGE A. DAVIS

General Oil Gas Corporation

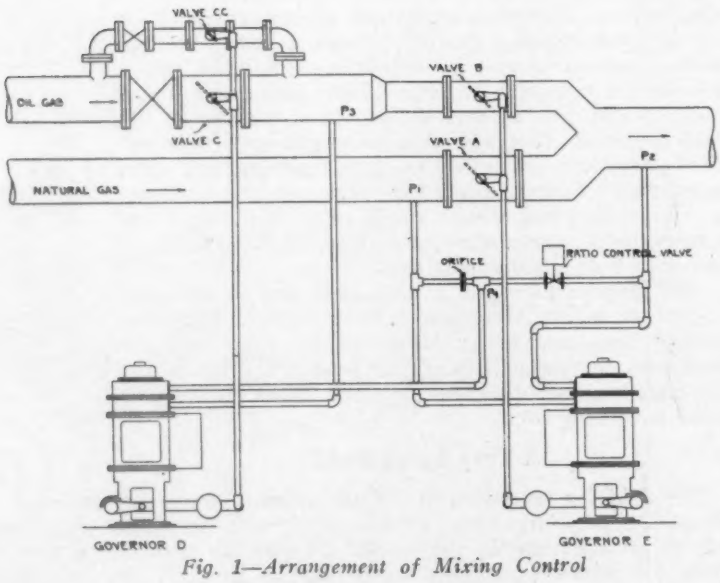


Fig. 1—Arrangement of Mixing Control

THE use of manufactured gas to supplement available supplies of natural gas during periods of peak demand is a growing practice. The Union Natural Gas Co., supplying gas to Windsor, Ontario, and other border cities faced the problem of meeting an ever increasing market with an inadequate supply of natural gas. Peak loads were anticipated in excess of available supply by 10% during the winter of 1929-1930, increasing to 30-35% in 1934-1935. To meet this condition the General Oil Gas Corp., New York, during the summer of 1929, installed at Windsor a 6,000,000 cu. ft. per day Dayton Process Oil Gas Plant. As part of the provision for load conditions expected after 1935 this plant was designed to permit extension to a capacity of 12,000,000 cu. ft. per day when required.

The natural gas supplied to Windsor has an average heating value of 1040 B.T.U. per cu. ft., and a specific gravity of 0.60. The Dayton process oil gas has a heating value of 450-500 B.T.U., and a specific gravity of 1.00. The maximum amount of oil gas permissible in a mixture without adjusting appliances is 30%; this mixture has a heating value of 870 B.T.U. per cu. ft., and a specific gravity of 0.72. The natural gas is piped under high pressure from the Tilbury field to a central distributing station located at the city gate of Windsor. This station comprises the Dayton process plant, 1,000,000 cu. ft. high-pressure storage for natural gas, 1,000,000 cu. ft. low-pressure storage for oil gas, and governors to reduce the pressure to the required distribution pressure, 8 to 14 pounds per sq. in. The oil gas is delivered from the low pressure holder to the mixing point by means of two stage G. E. centrifugal compressors.

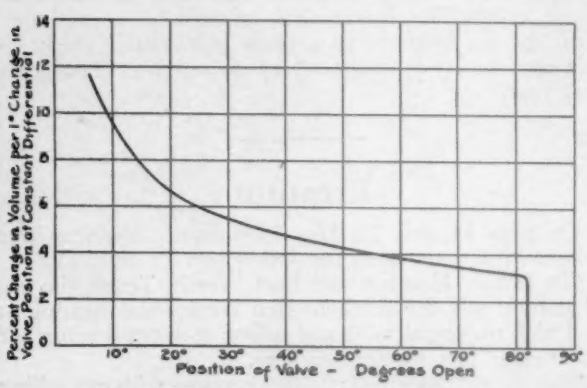


Fig. 2—Characteristics of Butterfly Valve

The load, being largely domestic, is subject to extreme fluctuations, as much as 3 to 1 during one hour. The winter load ranges from 100,000 to 1,000,000 cu. ft. per hour. The contemplated range of admixture ratio is 10 to 30% oil gas in the mixture. Thus the required volume range of oil gas is 10,000 to 300,000 cu. ft. per hour.

Explanation of Control System

A mixture control system devised by the Smoot Engineering Corp., New York, was found to be particularly suited to the requirements of this installation. Butterfly Valves A and B (Fig. 1) are interposed in the natural and oil gas lines respectively, and are linked together in the same angular position. Governor E keeps these in such position that the drop in pressure across Valve A is constant, e.g. P_1-P_2 equals 16 inches of water. Proportional flow for all loads is now established if the drop in pressure across Valve B is also kept constant, i.e. if P_3-P_2 is constant. A small line is by-passed around Valve A. Interposed in this line are an orifice, and the Ratio-Control Valve. The pressure, P_4, at the mid-point of this line is obviously less than P_1 and greater than P_2, and depends on the degree opening of the ratio-control valve. By arranging Valve C and Governor D (adjusted to zero differential) to maintain P_3 equal to P_4, the drop across Valve B (and as a consequence the ratio of mixture) is determined by adjustment of the ratio-control valve. This ratio-control valve is arranged for either manual adjustment or for motor adjustment with connection to a Cutler-Hammer B.T.U. controller whereby the ratio is adjusted automatically to maintain constant heating value of the mixture in spite of variations in heating value of the constituent gases.

The type of governor used is normally operated by air at 10-15 pounds pressure. In order to make the control independent of electric power and auxiliary air

compressor failures the governors were re-designed to permit operation on natural gas which was available at suitable pressure. The exhaust gas from the governors is piped to the low pressure holder.

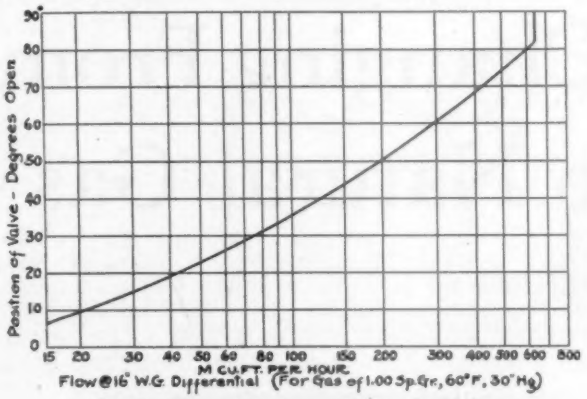
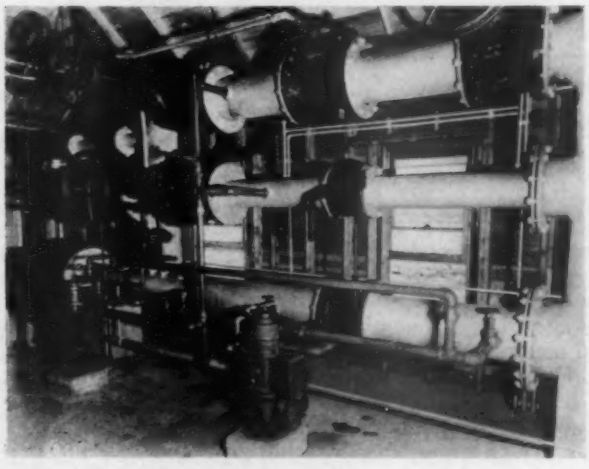


Fig. 3—Characteristics of Butterfly Valve

A frequent cause of failure of control systems is the use of valves too large for the service intended thereby inducing unstable regulation. As indicated in Fig 2, a butterfly valve maintains fairly uniform sensitivity within the range 20° and 80° open. It is evident that a governor adjusted to be stable and yet sensitive when operating a valve within this range would be unstable with the valve opening much below 20° or above 80°. All valve sizes were determined with this limitation in mind.

A governor of the type used can be adjusted to be extremely sensitive and quick of response. However, over-sensitivity induces unstability and "hunting." To insure inherent stability over the full range the system was designed so that extreme sensitivity would not be required. With the orifice in the ratio-control valve line of such size as to limit the pressure drop across Valve B to a minimum of 1.5 inch of water (with the ratio valve wide open), variations of 0.2 inch in maintaining the control differentials are permissible; this variation causing but slight variation in the volumetric ratio.



View of Mixing Control

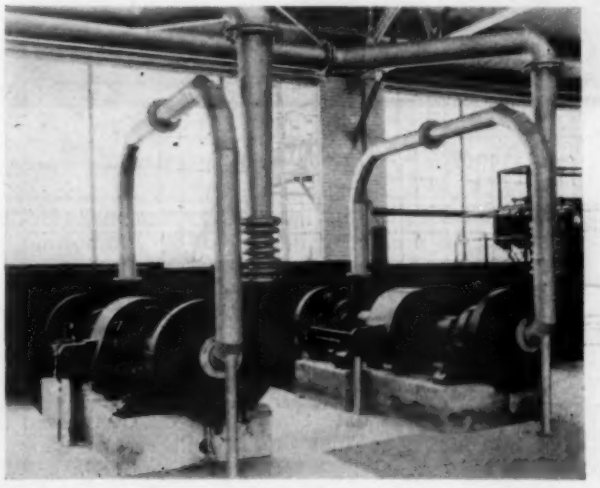
With Valve A of 12-inch diameter, handling natural gas of 0.60 sp. gr. at 60° F. and 12 pounds pressure, 75,000 to 1,000,000 cu. ft. per hour may be passed within the limits of stable regulations.

With Valve B of 8-inch diameter, handling oil gas 1.00 sp. gr. at 180° F. and 12 pounds pressure, a ratio range is permitted of 9 to 29% oil gas in the mixture.

Valve C has a more severe duty to perform, being required to produce a pressure drop of as much as 5 pounds per sq. in. at low flows, and as little as 0.5 pounds per sq. in. at maximum flow. For this duty two valves were required, Valve C twelve inches in diameter and Valve CC four inches in diameter. The smaller valve is used for the range 7,000 to 100,000 cu. ft. per hour and the larger valve 100,000 to 360,000 cu. ft. per hour.

Since the ratio of mixture is a function of the drop in pressure across Valve B it was possible to install a differential gauge calibrated directly in percentage of oil gas in the mixture.

In meeting peak loads during last winter an admixture of oil gas in excess of 10% had not been anticipated. However, on November 29th, the first day the plant was ready to operate, a break in one of the high pressure lines from the field necessitated a hurry call for operation of the plant. This was an unexpected and severe test of both the Dayton-process plant and the mixing control. For several hours 22% of oil gas was delivered to the city. During this period and during subsequent tests extending over several months the control system proved reliable, stable in operation, and able to maintain any desired ratio of mixture with precision. The heating value of the mixed gas was maintained within five B.T.U. of constant.



Centrifugal Compressors delivering Oil Gas to mixing point

The constituent gases of the mixed gas at Windsor are both of constant heating value. The auxiliary B.T.U. control was therefore not found necessary, and was not used in normal operation. However, the B.T.U. control apparatus was tested by stimulating variations in the heating value of the constituent gases. With the Cutler-Hammer controller adjusted to and in equilibrium at some arbitrary B.T.U. value variations from this value were corrected by the control at the rate of 30 B.T.U. per hour. A change of setting of the B.T.U. value entails a delay of several hours to permit the B.T.U. control mechanism to assume equilibrium at the new value. The writer understands that the Cutler-Hammer Co. has recently developed a B.T.U. control wherein this delay is eliminated.

Effects Upon Service and Economy When Changing From Manufactured to Natural Gas

GEORGE WEHRLE

Superintendent Gas Department, Public Service Company of Colorado, Denver

The Result of One Leakage Campaign

THE substitution of natural gas for manufactured gas presents a number of very important problems in the operation of the company, which, if neglected, may assume serious proportions and entail heavy expense, but if properly handled need not detract from the numerous advantages accruing through the use of the natural fuel. It is for the purpose of giving others the benefit of our experiences to date that this article has been prepared and we hope that others will record their experiences to the end that satisfactory methods and good practices may be established everywhere and be made known to the industry as a whole.

A review of the comparative characteristics of natural gas and manufactured gas reveals a number of differences which account for the effects noted in their distribution and use. The more important of these are enumerated as follows:

1. Natural gas is usually almost entirely devoid of water vapor whereas manufactured gas is usually saturated from 50% to 100%.
2. Natural gas contains no condensable hydrocarbons whereas manufactured gas does.
3. Natural gas is usually almost entirely odorless whereas manufactured gas always has a very distinctive odor.

About five years ago, we substituted natural gas for manufactured gas in a couple of small towns in Colorado, and immediately the distribution systems which previously had been satisfactorily tight began to leak like the proverbial sieve. In addition to the excessive leakage, dust accumulations began to fill up services and meters. An analysis of the situation disclosed that we had not given consideration to the effect produced by distributing a dry gas in a distribution system formerly sloppy wet from manufactured gas deposits. This dry gas was "moisture hungry" and it soaked up every drop of liquid in the mains and services just as effectively as it could be done with a sponge and a whole lot quicker. It pulled the moisture out of the joint packing and pulled the pasty deposits out of the minute holes that existed in pipes and fittings and left the former deposits as a fine dust to be carried along with the gas and deposited elsewhere to cause more trouble.

Typical Oil and Water Saturator

We corrected these situations by repairing the leaks and removing the dust deposits. After the distribution systems were made tight and the deposits removed, there was no further trouble experienced and leakage has since been normal.

After this experience, we did a little thinking before natural gas came to Denver, and decided to use common sense by giving the gas all the moisture it needed in a form that would cause no trouble. We decided to try to duplicate the former manufactured gas condition somewhat by injecting both oil and water into the dry natural gas. We thought if we could at least partially saturate the gas, we would relieve it of its "moisture hunger" and prevent its pulling the oil out of joint packing and drying up the old deposits. We saturate the gas with water vapor at the outlet of each regulator station and in addition inject gas oil as fine fog into the gas.

The apparatus for saturating the gas with water vapor consists of a cylindrical shell 4 ft. in diameter and about 9 ft. high. The gas from the regulator enters near the bottom of the saturator and emerges from the top. The pipe entering the saturator is formed into a manifold with nipples pointing downward. Steam is admitted in the inlet pipe to the saturator and the rate of admission is controlled by a temperature regulator which maintains the temperature of the outlet gas about 5° F. higher than that of the inlet gas.

Water condensation is allowed to accumulate in the bottom of the saturator to the level of a sealed overflow which is approximately 3 inches below the bottom of the nipples from which the gas emerges into the saturator. This allows the gas to impinge against the water and thereby absorb some of it in addition to that supplied by steam.

Types of Oil Foggers

We have used several types of oil foggers which are located immediately succeeding the water saturators. Our original foggers consisted of a shell made of 20-inch steel pipe about 9 ft. high. The gas enters near the bottom and emerges from the top of the fogger. The top part of the shells are filled with wooden trays. An oil burner spray is used with raw natural gas at 5 lbs. pressure as the injecting medium. These saturators have proven very effective in simply saturating the gas with the amount of oil vapor it would retain but are not so effective in supersaturating, when that is necessary. We have also installed types of oil foggers for supersaturating which are a commercial product.

The equipment used for admitting the odorant into the gas at the town border station is of our own design and manufacture. Its operation is somewhat unique, but so far has operated satisfactorily and entirely automatically in the proportioning of odorant to gas treated.

After two years' operation with saturated natural gas in Denver, the leakage has not increased. However, there are indications that in spite of our preventive work the interior of our distribution system is considerably dryer than it was with manufactured gas, and some trouble has been experienced from a shifting of the old deposits. We do not know that these conditions will get any worse but have already taken steps to supersaturate the gas in any district required, using oil fog produced in a hot oil fogger. We believe if we can keep the dust deposits oil soaked that they will not move, and furthermore, if we can film the interior of our distribution system with oil, it will prevent minute leakage.

In this connection, our problem is exactly the same as that in manufactured gas companies where the gas is dehydrated before distribution. What we are both attempting to do is to establish an equilibrium between the gas and liquids so that a minimum of trouble will be experienced in the distribution and utilization of the gas. The manufactured gas company takes a little of the liquid out of the gas and the natural gas company puts a little in. The result is the same.

Tarry deposits in our mains seem to have solidified and have the appearance of enamel. Naturally, wherever this has occured, there are no minute leaks. We still have some naphthalene trouble which is a relic of the manufactured gas days, although not of a serious nature. This is due to the evaporation of liquids from the old deposits releasing the light naphthalene crystals which float along to find a lodgment where they occasionally stop the flow of gas in a pipe. As these deposits are removed, this source of trouble is permanently eradicated, since naphthalene is not a constituent of natural gas. Last winter, the frost went down around our mains for the first time in many years and we had a number of cases of frozen mains and services due to the condensation and freezing of the water vapor admitted. Next winter, we expect to profit by this experience and reduce the degree of saturation below the dew point of the gas at existing ground temperatures. At low temperatures, gas has very little affinity for moisture and probably no bad effects would result from the total abolishment of water saturation during the cold winter months.

We believe the precautionary measures that we have taken are essential only in situations where manufactured gas has been previously distributed and particularly if cast iron mains with lead joints are used. In our new towns, or new districts, where gas has not been used before, we are building bottle-tight steel systems, tested at 50 lbs. pressure. In these systems, unsaturated natural gas is distributed and no trouble has been experienced.

Our meter and regulator diaphragms have remained in very good condition and we attribute this to the saturation of gas with water and oil, particularly the latter, and believe that the life of new leathers properly oiled will be materially increased over manufactured gas conditions. We are immediately increasing our routine period on new and newly diaphragmed meters to eight years and will extend that period as rapidly as conditions seem to warrant it.

Leakage and Leakage Prevention

As pointed out in previous paragraphs, the distribution of a dry gas in a system where saturated manufactured gas was used before is certain to result in excessive leakage due to the absorption of liquids from joint packing and from deposits formerly stopping minute holes. In our experience, supposedly tight distribution systems under manufactured gas operation soon became leaky systems with dry natural gas. Since the effect of the dry gas is apparent upon leather meter washers and upon leather washers usually used in appliance connections the effect is not confined to the underground distribution system but extends to the customers' premises. Prior to the advent of natural gas into Denver, we replaced all leather meter and union washers with a composition material called "Ebonite" and replaced all so-called "running threads" or "long screws" with rubber-packed Dresser couplings. We believe it wise for any company contemplating a

change to natural gas to take this precaution.

The distribution of an odorless gas presents a problem which is vastly different from that encountered in manufactured gas operations. Over a long period of years, the public has grown accustomed to the distinctive smell of coal and water gas and leaks on their premises are usually reported before dangerous concentrations result. Fortunately, it is now economical and practical to odorize natural gas through the use of a product of the oil refinery known as "Calodorant," which is produced by the Standard Oil Company of California and which makes the use of odorized natural gas equally safe as manufactured gas.

This odorant is admitted into the gas at the town border station in Denver, in amounts proportionate to the flow of gas. Approximately three gallons of odorant are used per million cubic feet of gas distributed. This amount of oil imparts a very distinctive odor to the gas which is easily recognizable by the customer. We have been notified of several serious leaks on customers' premises which might have resulted in dangerous consequences if the gas had been odorless and find that the number of minor leaks reported have resumed about the same proportions as formerly existed with manufactured gas.

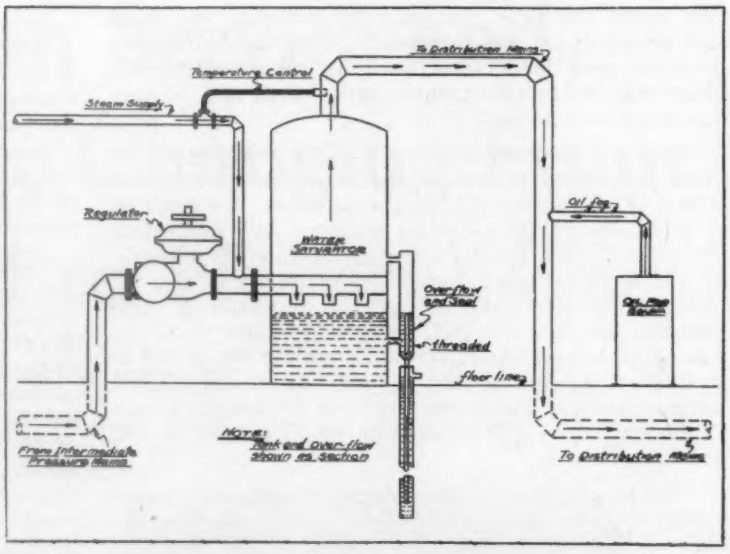


Diagram of Denver Humidifying and Saturating Equipment

Leakage Prevention Pays Dividends

We believe we may properly assume that natural gas saturated with water and oil vapors and distinctively odorized offers no appreciable difference in leakage hazard over the use of manufactured gas. However, the natural gas operator of the present day seems to have a consciousness of leakage that is not present to the same extent in the manufactured gas operator. This may be due to the psychology of the situation in that the natural gas operator has to buy his leakage from somebody else at the regular town border rate, whereas the manufactured gas operator carbonizes a little more coal or carburets a little more oil to make up for a shrinkage that is taken as a matter of course. Leakage prevention is a work that pays dividends in the distribution of any kind of gas; but it should be conducted on an economical basis only, that is, we should not spend more in preventing of leakage than the saved gas and the eliminated hazard accompanying such leakage is worth. Unless natural gas is saturated and odorized, the problem of leakage may be vastly more important than with manufactured gas.

We have adopted a routine of leakage inspection which has been highly beneficial and economical in our case and which will be described. We started out last year to inspect the premises of every business building in the city, particularly those in the down-town section and those for public use. The inspectors were provided with combustible gas detectors made by the Union Carbide Company which have proven very accurate and satisfactory. They made an actual test of the air along basement walls and in bulkheads. The age of the services and their appearance were also taken into account, and where the inspector was in any doubt an order was sent to the Street Department for an investigation. In the Street Department's investigation an actual pressure test was put upon the service. A check was also made of the interior piping and appliance conditions and hazardous conditions corrected. Tests were also made in all manholes of steam, telephone, electric and telegraph conduits and in storm sewer catch basins.

As can be well imagined, some very remarkable conditions were unearthed in this inspection and some dangerous conditions remedied. Hundreds of leaking services were found and no doubt the actual leakage recovered more than paid for the work done.

A great many unused and duplicate services were discovered and removed and unused stub services abandoned. A suspicion was directed toward drug stores and an inspection of every drug store or soda and ice cream dispensary in the city followed, which revealed that approximately 10% of the services were leaking at curb or under the soda fountain. This was due to salt brine either dumped at the curb or dripping from the fountain.

Routine of Leakage Inspection

The inspection of all business buildings required about six months, after which one man periodically visits and inspects all churches, schools, theaters and other places of public gathering.

Our leakage at this time does not indicate the necessity for systematic segregation and test of the entire distribution system, but in all cases where streets are to be paved, a systematic leak test is run. Tests are also run on all mains which are replaced for increased consumption before they are removed from the ground in order that we may know the approximate condition of our underground system.

The narration of our experiences with natural gas will no doubt indicate to those who read it that the work we have done in Denver was principally of a precautionary or preventive, rather than a remedial nature. We are satisfied that a proper attention to this phase will equalize the operations with natural gas to a comparable basis with manufactured gas so that the advantages of natural gas will predominate, and the Service Department will not find its work increased except through the increased number of customers and the different uses for natural gas, which is another story.

Cast Iron Pipe - Ally of the Gas Industry

SPECIAL CORRESPONDENT

THE gas industry like so many other successful major industries has had a checkered and varied career. Each time, however, when failure seemed most certain, the obstacles, instead of being stumbling blocks, were used as stepping stones to a larger growth. Its rise in the face of severe competition from the electric, oil, coal and coke industries is indeed interesting as well as inspiring.

Perhaps no commodity can boast of a record surpassing gas, for few, if any, cities which have ever had gas service are now, or ever will be, willing to be without it. Its natural advantages of low cost, economical transmission and distribution, high utilization efficiency, and convenience makes it truly "the ideal fuel." One does not have to glimpse far into the future, to see gas in general use for cooling homes, offices and factories in the summer, as well as heating them in the winter, and even the heating load is only in its swaddling clothes. The future of the gas industry is almost beyond imagination, and it will maintain a place in the sun for many centuries.

An Old Friend

Cast iron pipe also has a record for sticking to the job and seeing it through. In spite of the ravages of time, the first cast iron pipe line ever laid—over 265 years ago, is still in service. From the beginning of the gas industry, cast iron pipe has been its natural ally. Recent examination of some of the original cast iron gas mains has revealed them to be apparently as good as the day they were installed.

The gas industry has grown up from two very different directions. First, and by far the oldest, is the manufactured gas business, and it is still very much in evidence in the East, as well as several of the more thickly populated sections of the North and Middle West. The leaders in this phase of the business, schooled in the art of caution, built their distribution systems with an eye to the future, and cast iron bell and spigot pipe has been used almost exclusively. The pressures, up until recently, have been low—not over a few inches water pressure,—and the gas was wet or saturated. Bell and spigot cast iron pipe, with lead and jute joints or cement and jute joints, was eminently satisfactory.

The discovery of natural gas in various parts of the country, and its economic advantages for city distribution, developed another phase of the gas industry. The leaders in this field were first oil men, accustomed to dealing in high pressure, beyond the possibilities of cast iron pipe at that time, and their problems were different from those of the manufactured gas man. Where natural gas was plentiful, consumers were scarce, and it was therefore necessary to transmit the gas long distances in order to reach the market. Necessity for high pressures, an already acquired knowledge of steel pipe construction, and the absence of experience with cast iron pipe very largely prompted the use of steel pipe in this phase of the industry. The uncertainty of the life of the gas supply, and in the early days, the impetuous desire to build cheap and show a profit on the investment before the wells went dry, overshadowed any thought of building, beyond the immediate future. Under such circumstances, the long life of cast iron mains received little or no consideration, and as a consequence, relatively small amounts of it were installed.

The influence of each of these different phases of the gas industry upon the other is very evident today, and we find the manufactured gas companies reaching out and serving communities many miles distant. The natural gas companies are organized on the highest plane and building for permanence, and with consideration to making operating profits, rather than on the promotion and sale of the properties.

Natural gas is very dry, and manufactured gas is saturated or wet. It is interesting to note, however, that some manufactured gas properties are dehydrating their gas, and some of the natural gas properties are saturating theirs—all evidence of the fact that each is profiting by the experience of the other, and the problems and interests, once divergent, are fast coming to be common to a powerful unified industry.

Transmission Trends

The trend of the industry is to longer transmission lines, to reach all possible communities not already acquainted with the conveniences of gas, and intensive drives to increase the load factors in communities already being served. The economics of transmission and distribution is dictating higher and still higher pressures in pipe lines, to provide for the increased consumption already created, and that which lies just beyond.

This great change and development in the gas industry has had a far reaching effect upon the cast iron pipe industry, and like some of the dark periods through which the gas industry has progressed, has presented problems which at times, at least, were not so bright. The advent of by-product gas and better scrubbing at the water gas and retort gas plants produced a drier gas, and the manufactured gas man found that the lead and jute and cement joints in the cast iron bell and spigot pipe could not be depended upon for the same satisfactory performance that had prevailed in the past. This fact, together with the necessity for higher pressure in the mains caused him to set a very low pressure limit for cast iron pipe and purchase short-lived substitutes where the pressures were, or would likely be higher. This was a challenge

to the cast iron pipe industry, that has resulted in considerable research and final achievement. Not only has a satisfactory joint been developed, but cast iron pipe made by the centrifugal process has been developed that produces a material very much superior to pit cast pipe. The centrifugal process pipe is free from all blow holes, slag inclusions and other defects that castings from the other processes are subject to.

Cast iron pipe is now being used by many manufactured gas properties, where the pressures are as high as 80 pounds, and by natural gas properties where pressures are 200 pounds.

For so called low and intermediate pressures handling either dry or saturated gas, the bell and spigot joint for cast iron pipe is still being very extensively used. In addition to the usual jute and lead, or jute and cement joint materials however, a vulcanized rubber ring is also used in combination with them. The first of these rings was an endless round rubber ring with a hollow core, and it has given a splendid account of itself. The use of this ring was started about ten years ago in this country, but it was learned later that rubber rings in bell and spigot cast iron pipe joints had been in successful use in Europe and England for over forty years. Various other types of rubber rings have been brought out, and more or less extensively used. Some of these rings have just recently been subjected to, and successfully withstood, a very rigid series of tests consisting of 44 reversals with a stress equivalent to 30 degrees temperature change, and a pressure of 50 pounds. This test was described in a report presented at the 1930 A. G. A. Distribution Conference in St. Louis, by H. W. Batten, entitled "Pipe Joint Research at U. G. I. Laboratory."

Stuffing Box Joint

The stuffing box type of joint for cast iron pipe permits its use for the highest commercial pressures, and many gas properties are standardizing on its use for low and intermediate pressures as well. The joint consists of a cast iron follower, or gland, a rubber ring held under definite and positive pressure, and malleable iron bolts—thus, the maximum life against corrosion is provided in a pipe line capable of excessive joint deflection and longitudinal movement without leakage.

A recent survey of 54 of the larger gas operating and holding companies shows that seventeen of them are using cast iron pipe for pressures between 20 and 80 pounds. Some of those replying did not want their names published, but specific information is available upon request. The following are experiences extracted from some of the replies:

CONSUMERS POWER COMPANY

Approximately 16,000 feet, sizes 4", 8" and 10".
Pressures—35 to 75 pounds.
Bell and spigot joints with rubber rings, and stuffing box type joints—
Installed in 1928.
No leaks under test, or since installation.

QUEENS BOROUGH GAS AND ELECTRIC CO.—FAR ROCKAWAY, N. Y.

40 miles cast iron pipe in sizes 6" to 16", as part of gas Transmission System.
"The pressure that is carried in this system ranges from a minimum of thirty (30) pounds to a maximum of sixty (60) pounds in each twenty-four (24) hours."
"I would like to further state that cast iron pipe has been in service for the distribution of gas in this company prior to the year 1900, and we are only too glad to state that we are getting exceptionally good results."

MEMPHIS POWER AND LIGHT COMPANY—MEMPHIS, TENNESSEE

13 mile belt line around city—12" and 16" pipe.
Maximum pressure 45 pounds.
Cast iron bell and spigot pipe.
Combination cement and lead wool joints.

NASSAU AND SUFFOLK LIGHTING COMPANY—MINEOLA, (L. I.) NEW YORK.

30 miles cast iron pipe very satisfactory.
Maximum pressure 60 pounds.
Plain end pipe with couplers.
30,000 feet 16" plain end pipe with couplers, constant pressure 40 to 60 pounds.
Tested at installation to 110 pounds air, which remained for several days with no loss in pressure.

SOUTHERN CITIES DISTRIBUTING COMPANY—SHREVEPORT, LOUISIANA.—TEXARKANA, TEXAS.

3 miles—10"; 1 mile—6"
Pressure 15 to 60 pounds.
Bell and spigot joints with rubber rings, also some bronze welded joints.
Satisfactory experience dating back for 7 years.

CORPUS CHRISTI, TEXAS

A recent publication describes an installation of approximately 6 miles of centrifugally cast iron pipe for natural gas transmission at a pressure of approximately 200 pounds, and without interruption since 1925.
Stuffing box type of joint used.

That the cast iron pipe industry is in step with the gas industry is evidenced by the confidence being placed in its products for ever increasing requirements, and if the co-operative research work now in progress and contemplation, is an indicator, it will hold its place as the natural and logical servant and ally of the gas industry.

Ultra-Violet Radiation from Gas Stoves

THE ordinary gas stove, in which the clay radiants are heated to incandescence by means of Bunsen gas flames, is an excellent source of infra-red radiation. But owing to their low temperature these radiants, even when covered with special materials, claimed to emit ultra-violet, do not emit a sufficient amount of ultra-violet to merit consideration as a source of short wave length ultra-violet radiation useful for healing purposes.

This was established at the bureau by two independent methods of observation which were amply sensitive to detect ultra-violet radiation, if emitted. By photographing the spectrum, it was established that the intensity of the ultra-violet emitted by a gas stove is less than 1/800000 that of similar ultra-violet wave lengths in sky radiation.

By means of a sodium in quartz photo-electric cell, if was found that at a distance of 50 cm from a radiant heater, the ultra-violet emitted was less than 1/100000 of the ultra-violet of wave lengths less than 313 mu contained in noon hour June sunlight.— *Technical News Bulletin, No. 160, U. S. Bureau of Standards.*

Gas in the Road Building Industry

Interview With Mr. Chas. L. Ferry, Industrial Engineer of the Southern Counties Gas Company, Los Angeles, California

J. LYLE VANCE
Exhibit Manager, Natural Gas Bureau, Los Angeles

General View of Road Construction Plant

WITH truck loads of smoking hot road material rolling along the highways, the writer felt that by back-tracking these fellows to their lair a story of interest to the gas industry could be uncovered. The supposition proved correct and Mr. Chas. L. Ferry, Industrial Engineer of the Southern Counties Gas Co., with general offices in Los Angeles, has given the history of his company's experience in securing and holding the business which the preparation of road material represents.

"From the gas company's angle," said Mr. Ferry, "the business derived from road contractors is, indeed, very desirable. It comes in the summer, starting at a time when the high winter peak caused by the ordinary heating load is past and helps materially in filling up the summer output depression.

"While the satisfactory solution of the problems in connection with securing the road business has been difficult, the advantages gained have been well worth the energy and expense required to secure and hold it. Our first attempt on these problems was seven years ago. At that time the best we accomplished was to supply the necessary heat in the form of gas at a total overall cost of 40 cents per ton of material treated. In our newest, largest and most modern installation, with rates practically the same, we are doing the same work for less than 6 cents per ton, which we feel shows considerable progress. During the last seven years we have, as a result of careful study and observation, made improvements and savings to the consumers in practically every new plant served."

A road material plant consists of a rotary kiln, steam boiler, asphalt tanks, elevators, mixers and loaders. Foundations for these plants are maintained at various places, but the machinery is moved from foundation to foundation. This plan allows the base of operations to be moved within reasonable distances of the contract to be served and keeps the machinery working steadily.

While the machinery is being moved and erected the unloading of the rock and sand is underway so that by the time the plant is started, huge cranes have piled up veritable hills of raw material all about the plant in readiness.

When all is set to go, steam is generated in the boiler, wheels begin to turn and several four-mule teams hitched to "fresnos" begin attacking the hills of rock and sand and dragging it up to the intake end of the kiln. Here load by load it is dumped into a pit from which the bucket elevator picks it up and dumps it into the kiln set on an incline.

On the inside of the kiln seven-inch channel irons are riveted which carry the rock and sand up and drop it continuously, the incline causing it to work downward toward the "Dutch oven" and discharge spout, and toward the source of the heat. In this way the coldest material is coming in at the last or final end of heat travel and picks up its first heat from the cooler gases. This first heating in the inlet half of the kiln drives out the moisture. The heating in the discharge half being nearer the intense heat of the burners brings the rock and sand to its final temperature of about 380° F. This final temperature of 380° F. is required to make the asphalt mix well and to enable the final mix to come through the loaders into the trucks at 350°F.

There are several patented specifications for road material, but they are similar and vary principally in the proportions of the ingredients and somewhat in the manner of mixing. The plant described in this article is making "Warrenite."

"When we were first called in," continued Mr. Ferry, "the type of kiln used was of small diameter and shorter than they are at present and as we now look back upon our experiences we feel that a part of our failure to produce results commensurate with today's operations was due to the design of these kilns. In those days road contracts were smaller and the tonnage handled per day did not compare with present day operations, but we kept at the road contractors constantly, urging them to increase the diameter and length of their kilns to enable us to more properly apply the necessary heat.

"In the first plant to which we served gas, we ran a high pressure gas main and delivered gas to the burner at 25 pounds pressure because the tumbling barrage of rock and sand in the kiln looked to us then like an almost impenetrable wall through which we were going to be required to drive the heat generated. We supplemented our jet of high pressure gas with a large jet of steam taken from the boiler. In this plant this barrage was penetrated, but now we know that a lot of gas went up the stack, as the paint was scaled off the kiln for its entire length and off much of the stack as well, whereas one may now touch the loading end of the kiln without danger of burns, accounting in a large measure for the present low tonnage cost of fuel.

Drop in Fuel Cost

"In our next attempt, instead of using one large burner at 25 pounds pressure, we used three burners at 20 pound pressure—later we used four burners at 15 pounds pressure and still later this pressure was reduced to 10 pounds. During all of this time the fuel cost per ton was gradually dropping and the contractors were getting longer kilns of larger diameter. As the length and diameter of the kilns increased so did the size of the Dutch ovens increase which was helping materially. But finally the time came when high pressure gas mains were not available. We then used what we had; namely, 2 pounds pressure and on this plant we were able to use six burners and achieve the then unheard of results of turning out a finished ton of material for 7½ cents fuel cost. This included the cost of heating the rock and sand in the kiln and the cost of operating the boiler which heats the asphalt keeping it in a fluid state and allowing it to thoroughly coat and mix with the rock and sand."

This description of the history and experience of their company brought Mr. Ferry to the point of their newest, largest and most efficient plant which had been in operation about sixty days when he was interviewed.

"Early this year the Griffith Co., one of the larger road contractors, secured the contract for the construction of roads on a new development in Balboa Bay known as Lido Isle. This contract runs in excess of a million dollars and will require the use of more than 60,000 tons of rock and sand to accomplish the paving work.

"When we heard of this contract we approached the company in an effort to obtain the fuel load which this contract would represent. We were given the sad news that the Griffith Co. were going to forget us on this job, as they had been offered an oil contract which would be filled from a nearby oil well and had been quoted the extremely low price of 65 cents per barrel. The superintendent had estimated that this would enable them to do all of their heating and drying for a total over-all cost of from 4½ cents to 5 cents per ton of material treated. He said further that if there was any way gas could be utilized so as to bring the cost down to 6 cents per ton he would be willing to pay this differential, but felt that this was impossible as previous runs had never been below 7½ cents and he felt that the limit had been reached at this figure. We asked for time to do a little figuring, requesting that he delay the actual signing of the oil contract until he heard from us again.

"In the meantime we obtained the specifications of the plant which was to be erected at this site and found that the kiln was to be 6 feet inside diameter and 26 feet long, the Dutch oven was to be 26 inches net inside diameter and 6 feet long lined with 4 inches of refractory and the plant was to be a new installation throughout. This was larger than any kiln they had used previously and its rated capacity was to be greater, as it was designed to handle 100 tons of rock and sand per hour. By making a careful lay-out of the Dutch oven we found that ten No. 3 Nemec burners could be fitted to this oven and our theoretical computations made us confident that we could do the job at a fuel cost which would meet the figure specified providing automatic control was used and every provision made for conserving every B.t.u. possible.

"We had often recommended that their kiln and boiler be automatically controlled, but road contractors in general had always balked at the added expense, as they considered it. This time, however, they had laid an ultimatum down to us and we in turn made them a proposition which included full automatic control of temperature in the kiln and steam pressure at the boiler and required that we be given thirty days in which to demonstrate that we could meet the figure specified, at the end of which time if we had succeeded they were to use gas throughout the entire contract and pay a specified price for the equipment and installation. If we did not, they were to pay the gas bill for the thirty days regardless, but we would remove the gas equipment and they would go over to oil. Our proposition was accepted and we proceeded with the installation.

"We used the ten No. 3 Nemec burners as contemplated, connecting five of them direct with the gas supply and five on Partlow automatic control. In the outlet spout of the kiln we inserted an inch pipe in such a position that the outpouring rock and sand bathed this pipe at all times and into the pipe we inserted the thermo bulb of the control. On the boiler we installed a Neilan boiler fuel regulator set at 125 pounds steam working pressure. The boiler is not insulated, owing to the fact that the equipment is moved from one foundation to another, as mentioned previously, and the moving would destroy the covering. From the boiler we brought a steam line to the Dutch oven, extended a loop into the Dutch oven 40 inches, returned it back toward the burners, turned it up at a point 6 inches behind the ends of the burners and drilled two ⅜" steam jets into the pipe so that they would inject the superheated steam directly down the axis of the kiln.

"This jet of superheated steam is of material assistance in drawing in large quantities of secondary air which picks up the moisture from the rock and sand. At the same time this air helps shorten the flame and complete combustion within the Dutch oven. The force of the steam clears a path too for the hot gases and air to get through the tumbling rock and sand so that they can do their work.

"Another branch of this steam line was taken to the stack and pointed directly up the center of the stack. This was to accelerate the draft. The manipulation of the steam jets is based on creating just sufficient draft that no dust is seen working out at the point where the rotary drum of the kiln and the Dutch oven meet. Any dust coming out here is the signal for opening either the jet in the base of the stack a little wider or opening up the valve to the two jets of superheated steam at the burner end. As soon as the dust ceases to float out, the valves are left in that position.

Good Results Obtained

"Three No. 3 Nemec burners were installed in the boiler. The gas pressure at the service regulators was set to deliver a pound and a half pressure at the orifices and the plant was started. We are keeping well below our estimate and the business is being held.

Close-up of Burner and Control Installation on Kiln as seen directly in front of "Dutch Oven"

"The accompanying table gives the operating results gained up to the present time.

Date 1930	Cu. Ft. Gas Total	Tons Material	B.t.u. Per Ton
July 26	105	579	205,660
27-28	162	540	339,000
29	145	607	269,940
30	122	626	220,350
31	144	490	285,890
Aug. 1	121	526	259,900
2-3	129	526	276,850
4	140	575	275,720
5	117	569	232,780
6	132	600	248,600
7	132	615	242,950
8	124	615	228,260
9-10	148	647	258,770
11	129	491	294,930
12	129	536	272,330
13	109	422	291,540
14	121	582	235,040
15	117	618	221,570
16-17	143	615	262,160
18	122	622	221,480
19	124	615	228,260
20	88	357	280,110
21	125	518	272,330
22	123	530	262,160
23-24	145	436	350,300
25	123	622	223,740
Month total	3,219	14,479	
		Average B.t.u. per ton	250,860

Average B.t.u. per cubic foot = 1130

Note: Above division in month made due to meter being read on 25th of each month.

"It will be noted from the above table that there are some erratic features in regard to the B.t.u. per ton required to heat the rock and sand. This is accounted for by the fact that all rock and sand is washed before it is used and then let stand in mounds to dry out. Sometimes it is impossible for the contractors to allow as much time for this drying to take place as others with the result that some days the B.t.u. per ton runs higher.

"Everything else being equal, however, on the days when a large tonnage goes through the plant the B.t.u. per ton is decreased. This is, of course, in line with other production processes which show the same characteristics.

"The Griffith Company are more than satisfied with the plant and are thoroughly sold on the value of automatic control from the standpoint of fuel saving, labor saving and more even temperature of the rock delivered to the mixers. No attention is required except for lighting and turning off the gas and all indications point to the continued use of exactly this type of installation on all future jobs. Operation of one of their plants at Pomona, Calif. will start soon and they have given orders for it to be fully equipped like the plant just described with explicit instructions that it be full automatic."

Advantages of Gas Over Oil

The plant operators are particularly glad to use gas instead of oil, as the time required in the morning to light up oil and get steam in the boiler is very irksome and also because the fear of a sudden failure of the burners in the midst of a days work does not hang over them. With burners down on a road job and spreading crews idle waiting for material, costs run up fast and everyone is right after the plant operators to stop the loss. Oil burners are notoriously cranky and require a great deal of attention at all times. With gas these men have never suffered a shut-down from this cause and this is one of the reasons they are willing to pay a differential in favor of gas up to 25% at least. Road contractors are hard bargainers, but they know their costs.

Gas has always enabled the road contractors to turn out a better product, as the coating on the rock left by oil firing tends to cause the asphalt to be thinned and fail to spread well and be slower in setting up.

The specifications to which road contractors work permit no screening below a certain mesh, but a certain percentage of screenings just within the permissible range is required. Oil burners produce such a blast effect that a very considerable percentage of the finer required screenings are carried away up the stack and this loss must be made up by the addition of Portland Cement, as this is the only ingredient permitted to be added to make up the loss.

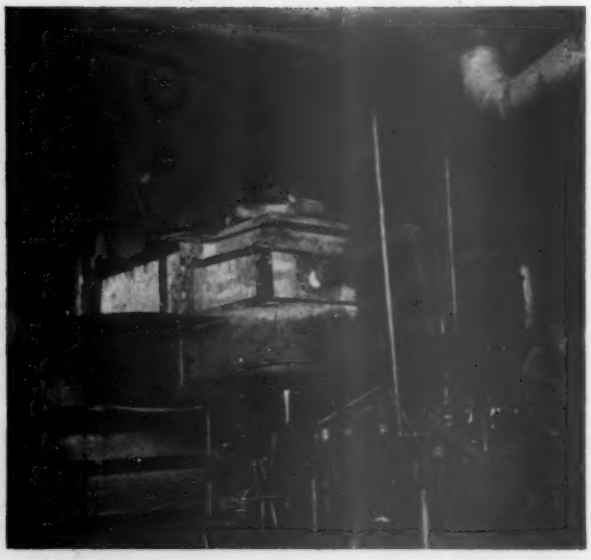
Gas at the pressure used on this installation carries away the fine particles below the allowable limit as shown in the accompanying illustration, but does not carry away those which fall inside the specifications, and as a consequence less Portland Cement has to be added. Every bag of cement saved represents a worthwhile reduction in cost and in the course of a large contract such as this the total savings in this one item alone are well worth while and are seriously taken into consideration.

"The experience we have had in this installation," said Mr. Ferry, "is typical of our experiences over a wide range of industrial applications. As we reduce pressures and increase the number of burners our efficiencies have gone up. Of course, all installations are not adaptable to this system of burner application, but continued success along these lines convinces us that we will serve our consumers best by inducing them to install more burners, and by serving gas at reduced pressures wherever the nature of the installation will permit."

"See What you Buy"-In Glass Made by Gas

LAWRENCE E. BIEMILLER

Supervisor, Fuel Sales, Consolidated Gas Electric Light & Power Company of Baltimore



Gas Burner on Glass Tank Feeder

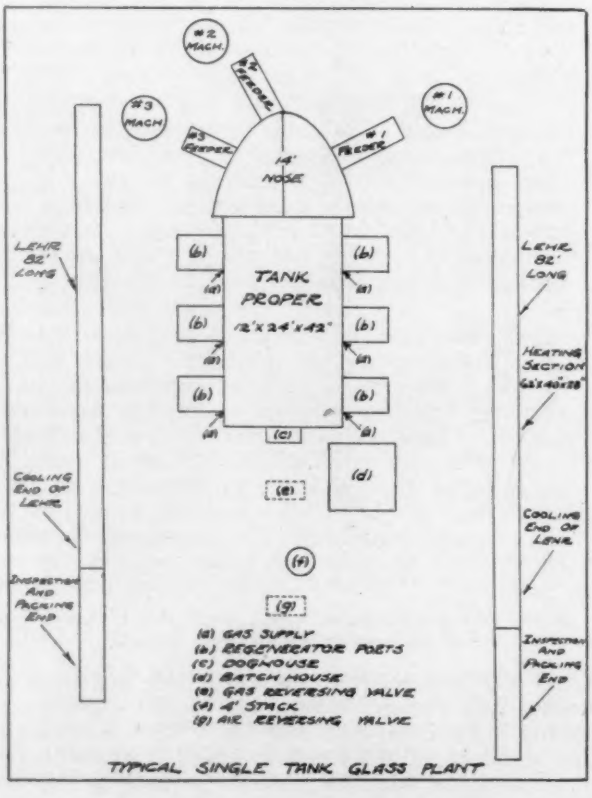
GLASS is an amorphous product of fusion, differing widely in composition. Ordinarily it is considered as a mixture of an alkaline silicate and the silicate of one or more bases. In the case of bottle glass, the alkali is usually sodium and the base calcium. The sodium is furnished as sodium carbonate (soda ash), the calcium as lime, and the silicate as a high-grade and pure sand. In addition a small amount of other chemicals are used to control the glass color. If a suitable mixture of these materials is subjected to a heat of about 2200 to 2400 degrees F. it melts, forming the substance which, on cooling, we know as glass.

Methods of Making Bottle Glass

At present, there are two methods of melting bottle glass,—in a pot furnace and in a tank furnace. The older method of melting, that in the pot furnace, is used mostly in connection with manual blowing of bottles. Pot furnaces consist of a large chamber, usually circular, around the circumference of which are placed a number of individual clay pots. These pots make a tight joint with this wall, practically sealing off the glass from the furnace atmosphere. The number of these pots varies from as few as eight to as many as fifty or more, in one furnace. There are openings in the circumferential wall so that batch may be added to, and glass taken from each of these pots. The usual method of operating a pot furnace, is to work (use glass from) one-half of the pots during a working day, then put raw batch in these pots to refill them at the end of the day. The next day the other half of the pots is worked, while the batches in the first pots are melting. On the third day the same series of pots is worked as was worked on the first day. Thus each pot is worked one day out of two, and an interval of about thirty-eight hours elapses between workings so that the batch has sufficient time to melt and form a homogeneous glass.

The second accepted method of making bottle glass is in a tank. This is a large rectangular receptacle covered with an arch of refractory brick. It operates on a continuous principle, that is, glass is being withdrawn from the front end continuously, and about every hour a new batch of raw material is added at the rear end. The tank is of such dimensions that it takes over two days for a given raw material to work through to the exit end of the tank. This insures a smooth, completely melted glass. These tanks are usually supplied with regenerators. At one time, the flue gases flow out through a certain regenerator, heating up the checker brick therein. Then, at the end of a given period, the direction of flow is reversed the flue gases leaving through the other regenerator and the air for combustion enters through the regenerator which has just been heated. It absorbs heat from the checker brick, entering the furnace at a temperature as high as 1850 degrees F. This results in a very high flame temperature, and a very good thermal efficiency.

This method of waste heat recovery is so efficient that



TYPICAL SINGLE TANK GLASS PLANT

flue gases which leave the melting chamber at 2300 degrees F. and above leave the regenerators at 850 to 900, when the regenerators are of proper size.

The heat balance of a well designed glass tank is about as follows:

To melt glass	*20.0% of heat input*
Radiation losses	*56.8% of heat input*
Loss in flue gases	*21.2% of heat input*

when operating at full load. As the load upon a glass tank falls off the efficiency decreases very fast, since the radiation loss is constant, and of course the loss in the flue gases can then be reduced only a little. At half load the thermal efficiency of the above tank would fall from 20.0% to 11.7%.

It is difficult to reduce this radiation loss by the use of insulation at the present time. Insulation tends to soften the refractories above the glass line, and to accelerate errosive effect below the glass line. New super-refractories will be necessary before the thermal efficiency of the present design of glass tank can be greatly increased. Some progress has been made in this regard in the last several years. The glass industry can afford to pay a greatly increased price for a super-refractory since the actual cost of material is only a small part of a tank repair cost. By far the largest items of cost are labor and loss of production.

One very interesting use of Industrial Gas is in connection with repair of glass tanks. The length of time a given size tank can be operated without a shut-down for replacement of blocks is proportional to the quantity of glass drawn therefrom. When a tank is operated near its capacity it is usually necessary to replace side blocks about once a year, and bottom blocks about once in three years, with the crown usually lasting somewhat longer than this. After a tank is repaired it is necessary to bring it up to operating temperature slowly, particularly if it is fired by a crude fuel, such as oil or producer gas. The following is an example of this heating up:

Melting chamber dimensions-ft.	—	*12 x 24 x 3½*
Tons of glass produced per day	—	*27*
Fuel used in normal operation	—	*Oil*
Temperature to which heated before crude fuel is used	—	*1500 degrees F.*
Time to heat to this temperature	—	*20 days*
cu. ft. of 500 B.t.u. gas used therefor	—	*490,000*

In this case the use of gas for this purpose replaced wood fuel due to the ability to control the temperature. At 65 cents for a thousand cubic feet of gas the cost of gas fuel was approximately the same as the cost of the wood.

Use of Natural Gas

Natural gas is extensively used in heating glass tanks. The quantity of heat required by different tanks will vary greatly depending upon their shape, construction, method of operating, type of glass, per cent of capacity, etc. Below is data on seven different tanks:

		Capacity Average Daily output	Million B.t.u. of fuel in tank
Tank No.	**Tank Size**	**Tons**	**per ton**
1	12 x 24 x 3½	27.5	10.5
2	14 x 16 x 3½	16	14.4
3	12 x 18 x 3½	14	13.3
4	14 x 20 x 3½	20	15.3
5	10 x 14 x 3½	12	18.7
6	12 x 24 x 3½	27	13.9
7	10 x 15 x 3½	10	19.5

In addition to the type of tank here considered in detail there are now coming into extensive use small tanks of the same general type, often L shaped, which have capacities of from 1 to 5 tons per 24 hours. These are often desired because they will supply just one machine feeder and result in unit operation. They can also be used to supply a small number of manual operators. This type of tank is particularly suited for the production of containers of glass of special color. The fuel consumption on these tanks is higher but their greater flexibility of use overcomes this disadvantage.

From the working end of the tank the glass flows out through a trough called a "feeder," at the end of which the desired amount of glass is periodically cut off and dropped into an automatic bottle-blowing machine which automatically blows the bottle, accomplishing about the same results as could be done by a manual operation. One type of machine can turn out from fifteen to thirty-two bottles per minute. In a six-day week, one tank with three such machines can produce 35,000 or 40,000 dozen bottles. Another type of machine produces bottles at the rate of 60 per minute.

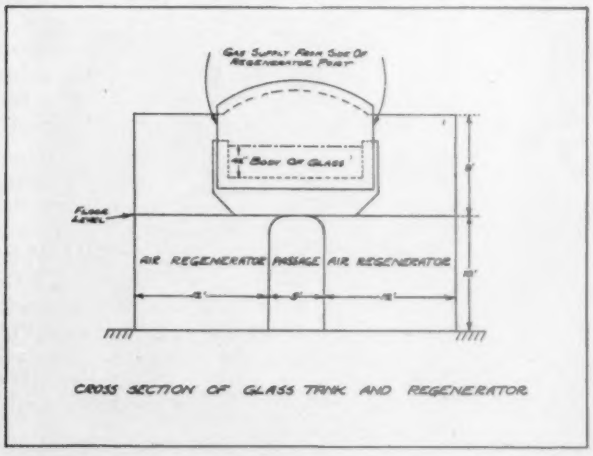
The success of this operation of automatically blowing the bottle is dependent upon having the mass of glass fall from the feeder into the machine at exactly the right temperature. The correct temperature at any time is depndent upon the size, weight, and shape of the bottle being blown. As previously stated, in this case, there are three feeders on the one tank. Practically always, each feeder is supplying a machine which is working on a different bottle from each of the other two. But the glass for all three feeders is drawn from the working end of the same tank, and therefore the glass entering all three feeders is the same temperature, although the glass leaving the feeders is desired to be at a different temperature in each case.

Feeder and Burner Arrangement

Therefore, each feeder is equipped with gas burners, so that the desired temperature can be secured and maintained on each feeder. In some plants two burners are used per feeder and in other cases, one per feeder. These burners are of a special design, and made of high temperature cement or of heat resisting alloy, so that they will withstand the intense temperatures of the feeder boot. Each burner is attached to a McKee High Pressure Proportional Mixer, so that a small amount of forty pound air is used to inject the desired amount of gas and the rest of the air necessary to perfect combustion. By this means a single valve control is obtained, without the necessity of installing either a gas or air compressor, since a glass plant with automatic machines has high pressure air available. This installation is particularly suitable because of its simplicity. Any temperature may be secured and maintained by simply regulating one valve, as proportional mixing is obtained throughout a very large range of fuel consumption.

The result is that for any given bottle the operator has to regulate the gas flow once or twice in an eight hour shift. When a change in bottle size is made he readily secures his new temperature by the same slight adjustment on a single valve. Before the installation of these simple gas burners, oil burners were used, with high pressure air. Besides the difficulties resulting from change in rate of oil flow, they had trouble every time they decided to change the temperature, due to the necessity of regulating two valves. At a temperature such as that in the feeder boots, which is as high as 2100 degrees F., a burner adjustment which results in even a slight insufficiency or excess of air may cause a big de-

crease in temperature and result in freezing the glass in the feeder boot. On each such a freeze production is stopped for from one-half to two or three hours. This was a frequent occurence on oil, but has not happened for periods as long as a couple months when using gas.



CROSS SECTION OF GLASS TANK AND REGENERATOR

The result has been that by using gas fuel on properly designed and installed equipment, increased and better production has been obtained, and the machine operator has been able to devote his full time to his machine, instead of being kept busy trying to maintain a desired temperature in his feeder boots. The value of reduced idle time can be appreciated when one knows that the average glass plant regards an idle bottle machine as costing twenty-five dollars per hour.

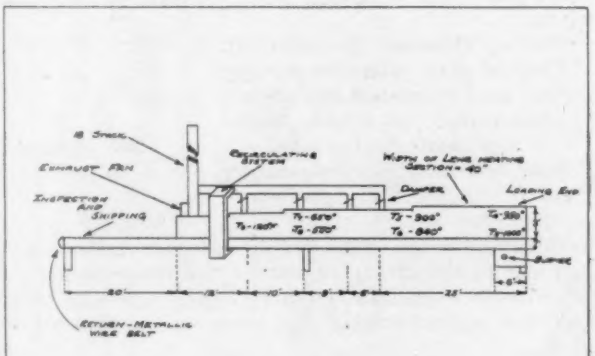
The Reason for Annealing

After the bottle is formed by hand or machine operation, it is still very hot, and the problem is to cool it down to room temperature. Glass is a bad conductor of heat. Its excessive brittleness is principally due to this fact, as in cooling down the outer portions of the glass solidify before the internal molecules have parted with their heat; contracted and established themselves in stable relation to each other. The internal strain thus resulting is the direct cause of the brittleness of the glass. Excessive brittleness is overcome by annealing, which process consists of slow cooling of the glass at a predetermined rate from a temperature of about 900 degrees F down to room temperature.

The hot bottle may be inserted directly in the annealing oven called a lehr. However, it is often desirable to have a small heating oven, colloquially named a "peanut roaster," adjacent to each finisher. This "roaster" contains two pans, one being pre-heated and the other being used to collect the ware. As each bottle is finished, it is put in this second pan. The roaster is maintained at a temperature of about 900 degrees F, so that the bottles are kept at this temperature while the pan is being filled, and then the filled pan of hot bottles is transferred to the lehr. The next bottles are placed in the preheated pan and a new pan inserted to be preheated. By this means the handling of the bottles is facilitated, and they are cooled less before reaching the lehr, thus reducing breakage losses during annealing. All plants in Baltimore having roasters use gas. A single bar burner is used in conjunction with a Proportional Mixer for Low Pressure Air or atmospheric injector and one pound gas. This gives a single valve control, so that the operator need to work only one valve when changing the amount of heat on his roaster. Robertshaw Thermostats maintain constant temperatures. By redesigning the roaster, originally built for oil, such improved thermal efficiency was obtained that the actual fuel cost is less than for oil heating. In addition to automatic control and an improved furnace atmosphere, there is a saving of compressed air. The original oil burner used 40 pound air, but the gas burner with proportional mixer for low pressure air uses "wind," that is, air at a pressure of only a couple of inches of water. Every glass plant has an abundance of the latter, which is obtained at a very little expense for power as compared with air of high pressure. The better furnace atmosphere seems to give clearer bottles, in the case of very small bottles, than were obtained when oil was used on a roaster receiving the same ware.

Function of the Lehr

From the roaster or directly from the bottle blowing machine, as the case may be, the bottles go to the lehr. The lehr is usually a long oven or furnace with a conveyor inside of it, on which the bottles are placed. This conveyor carries them through the length of the lehr which is usually about 80 feet, in about three hours. Heat is applied to the entrance end of the lehr and a temperature of 1000 degrees F maintained there. The temperature drops off throughout the lehr length and is near room temperature at the exit end where the bottles are removed. At present some of these lehrs are gas fired. There have been many improvements in lehr construction in the past few years, chiefly in the way of better insulation, pyrometers and automatic heat control. This has all resulted in a very low fuel consumption and at the same time the maintenance of an exact cooling curve with resultant minimum loss of ware in annealing. A well insulated, automatically controlled heat appliance is the very type best suited for the use of gas fuel, so we may expect to find gas more generally used on the new type lehr in the near future. From the lehr, the ware is inspected and packed and is then ready for storage and shipment.



SKETCH OF GLASS LEHR WITH TEMPERATURES AND RECIRCULATING SYSTEM

Besides these major gas uses there are numerous miscellaneous uses for gas around a glass factory. Some bottles have a rough ridge where the halves of the mold meet, which are smoothed down by a gas flame. Stoppers are also treated this way to give them a smooth finish before beginning to grind them to an exact fit. Stoppers which are given a metalic finish are often painted with colloidal solutions of silver, gold, copper, etc., and then baked in gas fired industrial ovens. Production on a bottle blowing machine is often increased by the use of miscellaneous flames playing upon the moulds at certain points as they revolve in the process of the forming of the bottle.

Gas By the Therm

H. T. EAST

President, Illinois Gas Association, Chicago, Illinois

IN the gay 90's the gas industry underwent a metamorphosis and emerged a purveyor of a gaseous fuel instead of an illuminant. Deprived of its lighting business the industry was forced either to find new loads to serve or to perish. What happened is too well-known to deserve repetition. The increased growth and expansion of the industry under the new order of things proved that heating was the logical application of gaseous energy and that the domestic and industrial heating field contained great possibilities.

The change from lighting to heating application meant drastic changes in the gas business. Instead of making gas with sufficient illuminants to meet candle power requirements, the heating value became paramount and regulative authorities changed their standards from candle power to British thermal units. Frequently the change was only permitted after agreement of the company to furnish gas containing 600 or more heat units per cubic foot. It now seems strange that in changing from a requirement which concerned the lighting intensity of a burning gas flame, which was to some extent at least independent of the quantity of gas used, to a standard involving a rather accurate "count" of the amount of energy or the number of units of heat it contained, no change was necessary in the measuring or billing basis. The unit of measurement and sale, the cubic foot, was retained despite the fact that from a heating standpoint the user should be more interested in the amount of heat units delivered than in the volume of gas furnished.

Changes in Heating Valve

Heating value standards for manufactured gas were at first set at around 600 B.t.u. per cubic foot. For economic reasons and other causes such as introduction of water gas production methods, high pressure distribution and long distance transmission, lower heating values were permitted from time to time until the standards were lowered in some instances to levels between 500 and 600 B.t.u. In recent years some companies sought permission to further reduce heating values and much expert testimony was produced in an attempt to show that the usefulness of gas to the consumer was independent of its heat unit content. In a number of cases permission was obtained to lower the heat unit content to 450 B.t.u. or even less. Taking the country as a whole there is so little uniformity in heating value requirements that any comparison of gas rates per 1,000 cubic feet is meaningless.

Notwithstanding all the contradictory statements and testimony offered in the past, authorities now pretty generally agree that gas is a fuel and its value to the user depends solely upon the heat units it contains and not the space it occupies. Having arrived at this conclusion it was natural for experts to point out that the cubic foot could no longer properly serve as a unit of measurement for billing purposes. The change to a more equitable and scientific basis of measurement and billing has been retarded by the lack of a suitable plan, the natural reluctance to change a long established practice and by fear of adverse public opinion.

As to a new unit it is obvious that the B.t.u. itself is too small to consider although this long established unit of heat value must be the basis for any change which is based upon the energy content of fuels. A unit of a hundred thousand or more British thermal units would be more suitable and in the "therm" we have such a unit. The therm was defined and authorized by the Gas Regulation Act of 1920 for use of gas companies in England, and it has been successfully used as a billing unit by several European gas companies for a number of years. A therm is defined as one hundred thousand British thermal units. Used as a gas measuring unit it is that amount of gas which will yield one hundred thousand British thermal units of heat. Some rate men feel that a unit should be adopted which would more nearly approximate the present heat unit contents of the present common billing unit, one thousand cubic feet of gas of average richness, but there are admitted advantages in using units already established. It appears that the therm will be used where and when similar systems of billing are inaugurated in the United States.

Adoption of the therm as a unit necessitates no immediate changes in metering or billing equipment. The metered consumption in cubic feet may be converted into therms by simply multiplying it by heating value per cubic foot and then dividing the result by 100,000 (set off five decimal places). An example follows:

Meter registration	3,200	cubic feet
Heating value of gas	565	B.t.u.
Total heat units	1,808,000	B.t.u.
Divide by 100,000	18.08	therms

The rate per therm can easily be factored from a cubic foot rate so as to produce the same revenue and not increase customers' bills. If customers' meters were plainly marked with the heating value of the gas passing through it, the customer has all information needed to check the bill computations. The therm could be defined on customers' bills which would also show the heating value to be used in converting the meter readings in cubic feet to the new units. Meters could be furnished which would read directly in therms by using dial gears of proper ratio and dial constants or multipliers such as now in use on some cubic foot meters. It is easily seen that a change to a therm basis offers no difficult problems from an operating and billing standpoint.

Advantages of Therm

But what are the advantages of changing to the therm basis? It is apparent that if the heating value requirements and other conditions are always to remain as they now are there would be little reason for the change even though the present system is not scientifically covered. Among the advantages of the therm basis are (1) it provides a unit which expresses a definite quantity or value which is of importance in engineering computations and in making comparisons of equipment efficiency, rates and consumption; (2) it permits reductions in heating value of gas where conditions require it without affecting the customers' rates; (3) it will make possible operating economies by enabling companies to

send more heat units through existing distribution systems and (4) it will permit the selection of a heating value which was most economical under local conditions and thereby permit the lowest possible rates to consumers. These advantages of the therm basis would do much to facilitate the vital changes now going on in the gas business in America.

To present a more comprehensible picture of the possible benefits to be had by the adoption of a heat unit basis for billing let us follow a hypothetical gas company and observe its application and effect. A new gas company is organized, the plant is completed and the company statisticians figure out a rate schedule. Three sets of rates are calculated assuming three different heating values. But the state commission specifies a minimum heating value and the company is forced to operate under the rate based upon the established standard although its experts have determined that another heating value would be more economical and therefore permit lower rates. The plant begins operation, its sales are satisfactory and the business becomes a going one. Operating costs later increase due to general business conditions beyond the company's control. Application is made for a rate increase which is opposed by the municipal authorities and groups of citizens. The rate case drags on for months and lacking relief, the service the company renders to the public suffers. As a compromise the commission, to avoid a rate increase, finally allows a reduction in heating value and the consuming public having won their fight against a rate increase are satisfied.

Effect of Natural Gas

Natural gas in considerable quantity is discovered 200 miles away. The high cost of bringing it to the city will not permit a lower rate but the company sees the possibility of benefiting by its introduction. It will save new investment in plant additions needed in the near future to increase production and will either postpone or make unnecessary enlargements of distribution system mains to handle the growing load. Natural gas is brought in but since the cost of service basis of rate making is adhered to, there is no possibility of rate reduction which the public expected. The value of the new gas service to the user is not considered and the public become dissatisfied and antagonistic toward the company. In reality the company's customers are receiving a substantial reduction, even when paying the old rates, since they are buying heat, not cubic feet, and the gas they now receive has a heating value much higher than that formerly delivered. The customer does not know or understand this.

Had the same company began operation under conditions where useful heat content and not volume was the billing basis things would have been entirely different. Its rates would originally have been fixed at lowest levels because the company would have selected a heating value per cubic foot that was most economical for that location and plant arrangement and the likelihood of rate increases would have been lessened. Due to conditions beyond the company's control it later became advisable to change the heating value as an adjustment to meet new conditions in the fuel market. The change is made at once and operating savings effected without rate changes which affect the customer. The sendout eventually increases to a point where capacity of distribution system was becoming inadequate. The necessary improvements are of such magnitude that a rate increase would have to follow their completion, but the situation is saved by an increase in heating value sufficient to permit delivery of an increased number of heat units to customers through the existing mains.

Natural gas with heating value double that of the standard then being used is introduced. The cost of delivery is such as to make this new fuel cost about the same per 1,000 cubic feet as the manufactured gas but the customers know they are buying heat, not cubic feet, and the new gas can be sold at a lower cost per therm than the old. The rate payers are pleased, no costly commission cases are necessary and the company's business is not retarded by unfavorable publicity and strained public relations.

Need for Therm Billing

The introduction of natural gas into various sections of the country where only manufactured gas has heretofore been available increases the need for the therm billing method. Natural gas is a fuel with a much higher heating value than that of its manufactured cousin. Natural gas, like water power, its counterpart in the electric field, is considered by the average lay mind to be a God-given gift, something that should be made available to all at little or no cost. They have heard how this natural resource has been furnished to those in the vicinity of producing wells at trifling cost. The general public knows little of its relative heating value or the enormous investment and operating costs necessary to transmit natural gas from remote producing fields to the areas where it can serve the needs of populated areas and established industries.

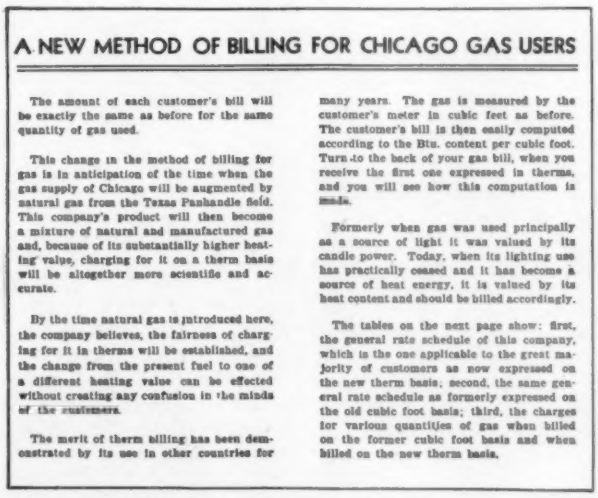
Introduction of natural gas into territories now served with the manufactured product should be preceded by campaigns to inform and educate gas users and the general public to the fact that royalties must be paid the owners of gas wells, that investment sometimes running into hundreds of millions of dollars must be made in transmission mains, that compressing stations must be maintained and operated at intervals along the route and that costly storage facilities must be provided in the distribution areas to insure continuous supply. The effect of all these things upon cost of gas at the customers' meter must be truthfully and carefully presented if the public is to accept the rates which will be necessary. Let me make clear that this is not an argument for high rates or a continuation of manufactured gas rates for natural gas. Rates should be kept as low as possible and the gas industry fully realizes that only by the lowest possible rates can these projects succeed because enormous quantities of gas must be sold and the load factor on the transmission systems kept high to justify the necessary investment and operating costs.

Where natural gas is to be mixed with manufactured the public should be made to know why this policy is followed. Unless they know that it is done to provide a fuel with heating value and chemical make-up comparable to that of the gas previously used to enable customers to use their present appliances and equipment and to further provide insurance against failure of supply due to pipe line interruptions or diminished well supply, they are likely to view the policy with suspicion.

An Actual Case

At least one large company in America has already adopted the therm as a unit in charging for its product. The Peoples Gas Light and Coke Company of Chicago filed new therm rates with the Illinois Commerce Commission and the new schedule was approved to become effective on all bills rendered after August 1, 1930. The cubic foot rates were converted to the therm basis so as to avoid any change whatever in the customers' bills

except for insignificant reductions on bills covering higher consumption and this merely to avoid fractional results.



A NEW METHOD OF BILLING FOR CHICAGO GAS USERS

The amount of each customer's bill will be exactly the same as before for the same quantity of gas used.

This change in the method of billing for gas is in anticipation of the time when the gas supply of Chicago will be augmented by natural gas from the Texas Panhandle field. This company's product will then become a mixture of natural and manufactured gas and, because of its substantially higher heating value, charging for it on a therm basis will be altogether more scientific and accurate.

By the time natural gas is introduced here, the company believes, the fairness of charging for it in therms will be established, and the change from the present fuel to one of a different heating value can be effected without creating any confusion in the minds of the customers.

The merit of therm billing has been demonstrated by its use in other countries for many years. The gas is measured by the customer's meter in cubic feet as before. The customer's bill is then easily computed according to the Btu. content per cubic foot. Turn to the back of your gas bill, when you receive the first one expressed in therms, and you will see how this computation is made.

Formerly when gas was used principally as a source of light it was valued by its candle power. Today, when its lighting use has practically ceased and it has become a source of heat energy, it is valued by its heat content and should be billed accordingly.

The tables on the next page show: first, the general rate schedule of this company, which is the one applicable to the great majority of customers as now expressed on the new therm basis; second, the same general rate schedule as formerly expressed on the old cubic foot basis; third, the charges for various quantities of gas when billed on the former cubic foot basis and when billed on the new therm basis.

Customer's Bill Inclosure announcing Change to Chicago Customers

The heating value of gas distributed in Chicago conforms to the standard requirement established by the Illinois Commerce Commission. This state regulatory body has jurisdiction over the rates, standards and service of all gas companies in the commonwealth. The commission requirements for gas distributed at low pressure are a monthly average of 565 B.t.u. with an allowable daily minimum of 530. An allowance of 35 B.t.u. is made for gas distributed at high pressure which is construed as pressure of five pounds per square inch or above. Since the city distribution in Chicago falls within the high pressure classification the company maintains an average monthly heating value of not less than 530 B.t.u. and is careful not to allow its gas to fall below 520 B.t.u. at any time.

The Chicago therm rates and the volume rates which they supplant are:

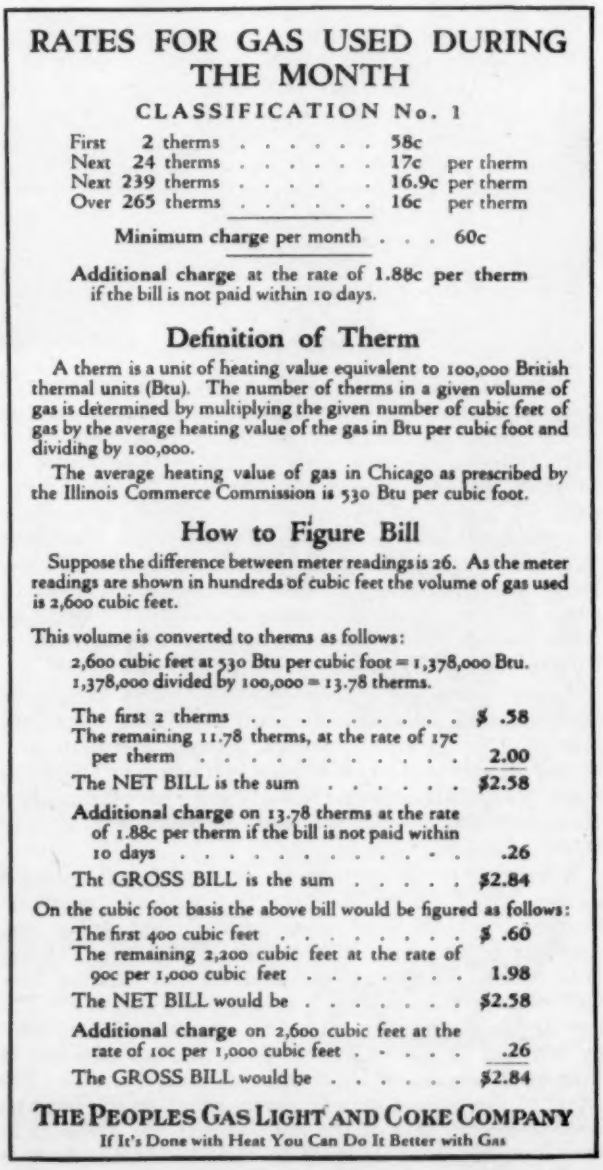
First	2 Therms	58c	
Next	24 Therms	17c	per therm
Next	239 Therms	16.9c	per therm
Over	265 Therms	16c	per therm

Optional Rate

First	400 Cu. Ft.	60c
Next	49600 Cu. Ft.	90c per 1000 Cu. Ft.
Over	50000 Cu. Ft.	85c per 1000 Cu. Ft.

There is no valid reason why any informed customer of this company should prefer to retain the old system of billing, since no possible benefit results and the company guarantees that bills expressed in therms will be no higher so long as the heating value of its gas remains unchanged and the cubic foot rates will undoubtedly be revised to conform to any change in heat content. However, for public relations reasons, the old volume rates were retained as optional and upon receipt of signed requests from customers the company will continue to bill on the former basis. The new schedule has hardly been in effect long enough to determine how many customers will prefer the old basis strongly enough to request the change, but only a small percentage have taken this step to date. The number of requests for change or explanation of new schedule's effect upon bills will probably increase when any change in heating value with its new conversion multiplier, is announced. It will, of course, be possible to withdraw the optional schedule as the new basis of charging is understood by the majority of the company's customers and those who speak for them.

As previously stated, the greatest obstacle to a revision of the billing system used by gas companies is the weight of public opinion or the attitude of the consumers which many are pleased to call public relations. Public understanding is not aroused easily, even upon subjects of universal appeal and when the question is of a technical nature it is doubly difficult of accomplishment. Any change in gas billing will likely be regarded with suspicion by many and some opposition will develop. The therm as a billing unit possesses advantages for the customer and if these are understood the objections will disappear. The public in general and particularly our customers must be fully informed of the facts about gas measurement and billing and the reason for the changes explained. Publicity and educational efforts of this nature require time, and to be effective must start long before the actual date of change. The time to begin preparing for future changes of this nature is *NOW*.



RATES FOR GAS USED DURING THE MONTH

CLASSIFICATION No. 1

First	2 therms	58c	
Next	24 therms	17c	per therm
Next	239 therms	16.9c	per therm
Over	265 therms	16c	per therm

Minimum charge per month . . . 60c

Additional charge at the rate of 1.88c per therm if the bill is not paid within 10 days.

Definition of Therm

A therm is a unit of heating value equivalent to 100,000 British thermal units (Btu). The number of therms in a given volume of gas is determined by multiplying the given number of cubic feet of gas by the average heating value of the gas in Btu per cubic foot and dividing by 100,000.

The average heating value of gas in Chicago as prescribed by the Illinois Commerce Commission is 530 Btu per cubic foot.

How to Figure Bill

Suppose the difference between meter readings is 26. As the meter readings are shown in hundreds of cubic feet the volume of gas used is 2,600 cubic feet.

This volume is converted to therms as follows:

2,600 cubic feet at 530 Btu per cubic foot = 1,378,000 Btu.
1,378,000 divided by 100,000 = 13.78 therms.

The first 2 therms	$ .58
The remaining 11.78 therms, at the rate of 17c per therm	2.00
The NET BILL is the sum	$2.58
Additional charge on 13.78 therms at the rate of 1.88c per therm if the bill is not paid within 10 days	.26
Tht GROSS BILL is the sum	$2.84

On the cubic foot basis the above bill would be figured as follows:

The first 400 cubic feet	$ .60
The remaining 2,200 cubic feet at the rate of 90c per 1,000 cubic feet	1.98
The NET BILL would be	$2.58
Additional charge on 2,600 cubic feet at the rate of 10c per 1,000 cubic feet	.26
The GROSS BILL would be	$2.84

THE PEOPLES GAS LIGHT AND COKE COMPANY

If It's Done with Heat You Can Do It Better with Gas

Information appearing on back of Bills

The Gas Producer

II-Operation and Items related to Operation

JOHN W. ROMIG

(*Continued from September issue*)

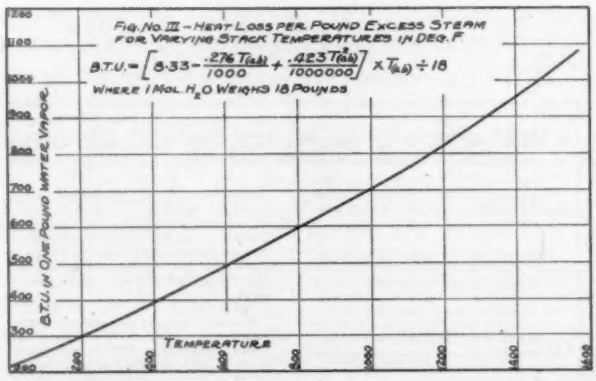
WATER vapor in a gas producer cools the incandescent bed below the ash fusion temperature by dissociation and by taking up sensible heat from the bed. An excess of water vapor increases the inerts in the ultimate gas unless the gas is used cold. Excess water vapor carries heat out of the furnace or away from the process to the stack. Figure No. 3 shows the heat loss in the stack due to water vapor in gas admitted for combustion in a furnace. An excess of water vapor represents a direct economic cost of operation and high excesses unduly increase the cost of producer operation. As from 3 to 5 pounds of water vapor are supplied per pound of coal, the steam costs are quite sizeable, so a 10% excess would amount to a direct increase in cost of over one dollar per 50-ton car of coal.

Influence of Steam

The addition of steam when forcing a producer to greater capacity is necessary as more steam and air are required with an increased quantity of fuel. More gas is then made and with a constant size outlet the pressure may build up in the gas zone and this in turn calls for a slightly greater air-water vapor pressure so excess steam may be admitted under these conditions. With all other conditions constant, an increase of steam tends to increase H_2 and to decrease the CO in the gas. Excess steam is often necessary to keep ash from fusing and under these conditions is an essential to good physical operation of a producer.

In the case of some large producer plants using large quantities of steam at moderate pressures, consideration may be given to bleeder turbine operation as a means of greater overall plant economy. There are some possibilities along these lines of operation where electric power is needed and is purchased at high rates.

Admitting more air than is required furnishes more oxygen than is necessary for the producer reactions, causing combustion of some of the combustible constituents of the gas. The result is that the CO and H_2O content of the gas is increased and the heat content of the cold gas is correspondingly lower. The loss due to combustion caused by excess air is increased by bringing in approximately four volumes of inert N_2 with each volume of O_2, thereby diluting the gas. The effect of the diluent may be partly offset by the increase in the sensible heat of the hot gas. If the gas is to be used hot, the loss is equal to the loss of the heat in the producer, and conduits plus the loss in heating the



excess of inerts in the furnace. If the gas is to be used cold or with ample recuperative or regenerative equipment, the loss is equal to the total loss due to the combining of combustible with O_2 plus the loss of re-heating excess inerts, CO_2 and N_2 when the fuel is burned.

It is therefore desirable to keep the air proportion as low as possible to burn all the carbon in the incandescent bed before the carbon cools below the combining temperature. Excessive carbon in the ash—over 10% on the dry basis—indicates an insufficient supply of air or too much poking. Excess air is noted by the tendency of the fuel bed to burn through quickly and by an increase in producer and gas temperatures. It is difficult to calculate losses due to excess air in producer gas formation and show them graphically, as there are so many variables that calculations on a comparable basis are difficult to represent. Each problem is best solved separately.

Fuels ranging from anthracite coke to lignite may be gasified, although conditions affecting producer operation will vary considerably. With high fixed carbon and low volatile fuel a gas high in carbon monoxide results. High CO has a tendency to give lower flame temperatures and slower flame propagation, but greater luminosity in a combustion chamber than H_2. Fuels with low fixed carbon and high volatile content as hydrocarbons and hydrogen produce gas having high flame temperatures. The mist from volatiles gives luminosity and good radiant heat transfer.

Increasing Producer Capacity

Producer capacity can be increased by using higher b.t.u. fuel and correspondingly decreased by using a low b.t.u. fuel. Where producers are crowded, a high b.t.u. fuel will give added capacity and fewer operating difficulties. In general, the higher the thermal content of the fuel, the more satisfactory the fuel is from the viewpoint of producer operation, providing that the fusion point of the ash is not too low. A low temperature fusion point ash is undesirable as clinkers form with little provocation, the result being holes in the fire bed during which interval a lean gas in evolved. Much laborious poking is necessary to maintain a good quality of gas with extremely low fusion point ash.

Whenever a producer not provided with steam protected poke holes, is poked, there is a loss of gas around the poke holes which may equal 5% of the total gas evolved during the poking period. Another disadvantage in poking is the tendency of the gas to pick up solids and carry them over into the conduit or furnace during the poking interval. There always is some

(*Continued on page 73*)

It Is a GOOD Gas Range That Has This Red Wheel

Patents Pending

TIFFIN model CASH PRICE $99.75 except in extreme Southeast, Rocky Mountains and beyond

Patents Pending

PATRICIAN model CASH PRICE $195.00 except in extreme Southeast, Rocky Mountains and beyond

A New Magic Chef Model at an Attractive Moderate Price

SOMETHING we have always wished for but thought it couldn't be produced!" That's what dealers who have seen the new TIFFIN Model say about this new member of the Magic Chef family.

Priced under $100, this new Magic Chef, in a more compact and convenient size, brings Magic Chef charm and style within reach of thousands of women who could not afford the larger models.

The September 20th issue of the Saturday Evening Post will carry a double page advertisement, in full color, of the Tiffin Model. Page advertisements in color in other leading magazines just before and after the Post announcement will attract wide-spread interest to this remarkable gas range achievement.

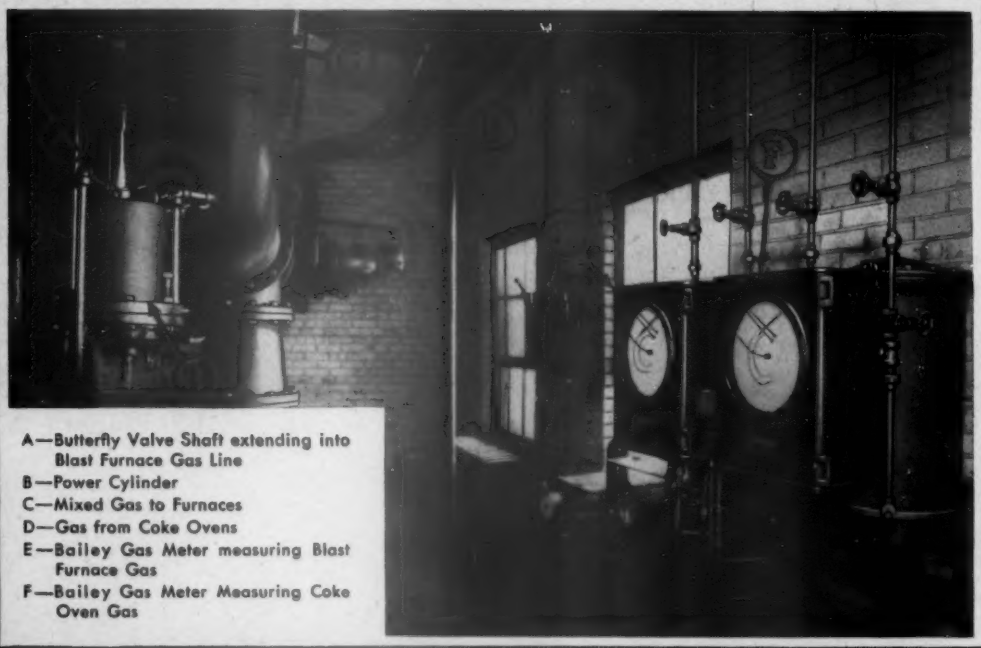
Tie up your store to this important national advertising to get your full share of the substantial demand that will be created for the Tiffin Model of the Magic Chef. There is nothing in the gas range field today that can match it at the price. It will pay you to get full details.

Send name and address for free copy of booklet showing modern kitchens.

Magic Chef

AMERICAN STOVE COMPANY... DEPT. B, 801 CHOUTEAU AVENUE, ST. LOUIS, MO.

LARGEST MAKERS OF GAS RANGES IN THE WORLD



A—Butterfly Valve Shaft extending into Blast Furnace Gas Line
B—Power Cylinder
C—Mixed Gas to Furnaces
D—Gas from Coke Ovens
E—Bailey Gas Meter measuring Blast Furnace Gas
F—Bailey Gas Meter Measuring Coke Oven Gas

GAS MIXING *by* AUTOMATIC CONTROL

IN the installation above Bailey Ratio Control solved a particularly difficult problem, resulted in appreciable fuel economy and insured the best combustion efficiency in firing industrial furnaces. Blast furnace gas being too lean, and low in heating value could not be used for the purpose intended. Coke oven gas, with a far greater heating value than necessary, could not be economically used alone. Bailey Ratio Control made it possible to mix these two gases in the proportion of two parts of blast furnace gas to one part of coke oven gas, which results in a very satisfactory fuel. ▲ Fluctuations in the flow of gases are automatically corrected by this control so that the proper mixture is held to constantly. ▲ If you are mixing fluids you will want to investigate the possibilities of Bailey Ratio Control. Write for Information.

BAILEY METER CO.
1049 IVANHOE ROAD • CLEVELAND, OHIO

WHEN -- COMPETITION --COMES

Customer satisfaction is the backbone of Gas Sales. One Gas Company found that 60% of the galvanized, underfired automatic heaters that they had sold, were being used non-automatic, giving less satisfaction and less gas consumption than a tank water heater would have done.

Every Kompak Water Heater sold means an enthusiastic customer, completely sold on gas for water heating, with a closed door for any competing fuel.

Those Companies who are looking for a permanent water heater installation, are pushing COPPER KOMPAKS.

THE KOMPAK COMPANY,
New Brunswick, N. J.

KOMPAK
TRADE MARK REG.

Make Thread, Flange & Gasket Joints Leak-Proof with

Q-SEAL

(PATENTS PENDING)

"The Pigment Expands"

Apply heavy film coat to threads, flanges, gaskets or metallic surfaces to be sealed, with ordinary paint brush or dauber. Put joints together in regular way. They will be leak proof.

The Principal Pigment In Q-SEAL

EXPANDS—and joints that are defective, such as threads cut with dull tools, warps in flanges, or broken or burned places in gaskets, can be permanently and effectively sealed with Q-Seal, due to its large expansion when subjected to heat. This expansion fills all imperfections and the expanded material is strong enough to hold regardless of temperatures and pressures.

Leak-proof Gasket Joints in Boiler Hand-holes or Manholes can be made with Q-SEAL

Due to its expansive properties, Q-Seal is an ideal compound for sealing gasket joints. Paint gaskets on both sides, or dip them in Q-Seal, and apply them in the regular way.

Shipped in 1 and 5 lb. Cans
10, 30 and 60 lb. Steel Containers

Seal Joints in Lines Carrying Oils, Gasoline, Acids and Chemicals with Q-SEAL

The proper sealing of joints carrying commodities is very important. Q-Seal is impervious to oils, gasoline, chemicals, acids, and in fact, anything but water. Water is the only solvent, but it is being used successfully in cold water joints.

Make Joints in Automobile, Truck, Aeroplane, Diesel or Other Internal Combustion Engines leak-proof with Q-SEAL

Due to the fact that Q-Seal is impervious to oils and gasoline, and that it expands, it is ideal for sealing such joints as cylinder head, manifold, differential and transmission housing, and oil pan gaskets on automobiles, busses and trucks; and it is good for sealing all joints in internal combustion engines.

Get More Surface Coverage at Less Cost per Joint with Q-SEAL

From a standpoint of surface coverage, or cost per joint, Q-Seal is, as far as we know, the most economical compound on the market today. One pound of it will fabricate more joints than four pounds of white or red lead. It does not dry brittle like litharge and glycerine, does not gum and stick like shellac, and does not shrink like graphite and oil, or other compounds which use oil as a vehicle or mixing agent.

Break Joints Easily that have been Fabricated with Q-SEAL

Due to the fact that all pigments used in compounding of Q-Seal are natural lubricants, joints that have been fabricated with it can be broken easily and clean, regardless of age or conditions subjected to.

Ask for a Sample Can

QUIGLEY COMPANY INC.
INDUSTRIAL SPECIALTIES
56 West 45th Street, New York
Distributors with Stock and Service in every Industrial Center

The Gas Producer

(*Continued from page 68*)

loss within the producers due to blow holes common to beds comprised of low fusion ash before the producer attendant realizes or is made to realize the necessity of poking. Poking also tends to force some carbon into the ash bed, thereby causing additional loss. The above reasons show that high fusion point ash fuels are desirable for good producer gas and for ease and economy of producer operation.

The amount of dirt, dust and fines in a fuel should be kept at a minimum, for when the fuel is discharged and drops to the fuel bed, the gas leaving the producer tends to carry small particles of solids over into the conduits and if scrubbers are not used the foreign matter is carried into the combustion chamber. Washed fuel is, therefore, specified for many producer plants. However, a re-screening operation is used in some plants with success, while still other plants do not have the advantage of either and get along very nicely. As a rule, the disadvantages of fines are dependent upon the process for which the gas is used. Pieces over one-fourth inch are not undesirable in a fuel, although too many small particles of fuel tend to make dense fuel, reaction and combustion zones, thereby reducing the producer capacity. Too large pieces of fuel tend to increase the carbon or coke content of the producer ash.

The No. 2 nut coal should pass over a 1¼-inch round hole shaker screen and through a 2-inch round hole shaker screen. For No. 1 nut coal, the coal should pass over a 2-inch round hole shaker screen and through a 3-inch round hole shaker screen. Either of these preparations reduce fines in the coal at the mine to a minimum. A long drop into a coal car from a loading boom at the mine tipple will cause rather severe coal breakage, as also will long railroad hauls and rough and improperly designed fuel handling equipment used during the unloading and delivery of the coal from the car to the producer.

Characteristics with Bituminous Coal

Bituminous coals as a rule contain more tar than anthracite coals, so thinner fuel beds must be used. This is one of the features of successful operation on Illinois coal. The producer gas from bituminous coals has excellent flame properties for application in industrial furnaces.

It is wise to place producer fuel contracts on a yearly basis, as frequent changes of fuel upset producer operations. Changes result in periods of inferior gas and low producer efficiencies before the peculiarities of a new fuel are known.

By the terms "hot" and "cold" producer gas as discussed under this subject heading, reference is made to the temperatures at which the gas is discharged from producers. Gas may be discharged at temperatures as high as 1500° F. or as low as 800° F. Some producer engineers favor high gas temperatures, while others favor low gas temperatures.

High gas temperatures mean that more of the fuel must combine with oxygen in the producer than combines in the case of lower temperatures, so there will be more inerts per pound of fuel in hot gas than in cold gas. Furthermore, hot gas and greater producer temperatures increase the radiation losses from the producer shell, wear and tear on agitators is increased and heat losses from gas conduits and canals are greater. If the gas is to be used with recuperative or regenerative equipment, hot gas is to be avoided, if the utilization of heat absorbing refractories is to be realized. If gas is to be used hot and conduits and canals are long, it is desirable to have the gas hot enough so that condensation of tars is not excessive. The proper gas temperature for any operation is the minimum temperature at which condensation of tars in conduits is not excessive.

The temperatures of gas that may be satisfactory in one plant are unsatisfactory in other plants because of the varied uses for the gas, design of conduits, furnaces, heat absorbing refractories and fuel. The placing of insulation over producer gas conduits avoids loss of sensible heat and if the conduits are in a closed building, insulation aids in keeping the room temperatures lower, thereby serving a double purpose. Producer gas combustion is best when tne gas is at high temperatures, around 2000° F. or higher, as there is about 50% inert dilution of the gas and the thermal content is relatively low for a gaseous fuel. Of course, producer gas will kindle at low temperatures with a high heat loss in heating inerts. A gas temperature of from 950° F. to 1100° F. as it leaves the producers, using Illinois coal, gives very satisfactory results and it is seldom that operators are justified, when using Illinois coal, in maintaining higher gas temperatures unless the gas mains are long or poorly insulated.

Cost Data

The total cost of gasifying a ton of fuel of any kind, whether anthracite, bituminous, coals, coke or lignite, includes a portion of fixed charges, charges on buildings and enclosures, hoppers, producer equipment and fuel handling equipment, together with costs of power, light, steam, water, labor charges, direct and indirect, and repairs. In the tabulation below, the total costs of gasification of fuel over a period of a year are shown for actual industrial producer plant using semi-mechanical producers, and they compare favorably with those of the average producer installation.

Table No. 1—Cost Data on Gasification of Coal

Item	Cost per Ton Coal of 12,000 b.t.n. as rec'd
Coal Handling (Mechanical)	$ .09
Producer Attendants	.22
Removing Cinders	.13
Cleaning Producers & Canals and Cleaning Up	.04
Inspection, Lubrication	.03
Small Tools—pokers principally	.01
Water for Pans and Agitators	.11
Steam	.43
Electric Power	.02
Repair and Maintenance Producers	.03
Insurance and Taxes	.05
Building	.02
Depreciation	.36
Total Gasification Cost per Ton Coal	$1.54

The cost values shown in Table No. 1 were derived from total costs of operating a producer plant consisting of three full mechanical and sixteen semi-mechanical producers for the year 1927, using Illinois coal with a low fusion point ash. Gasification costs vary within rather wide limits and in some cases will reach as much as $2.50 per ton, depending upon the rate at which coal is gasified, standby losses, etc. The costs above are for producers under almost continuous operation and are therefore, rather low.

Using a gasification cost of $1.54 per ton of coal costing $2.50 as delivered, the fuel cost gasified is $4.04 per ton. If 60 cubic feet of gas are evolved per pound

of coal, then the cost of gas will be \$4.04 divided by $\frac{60 \times 2000}{1000}$ or \$.0336 per thousand cubic feet of coal gas having a thermal content averaging 150 b.t.u. per cubic foot of cold gas.

It is interesting to note that while producer gas is a relatively low heat content gas, its low cost has brought it into extensive use in industry where other gas fuels are more expensive and limited in quantity.

A recent use for blast furnace gas is to admit the blast furnace gas with its approximate 12% CO_2 value to gas producers instead of steam, thereby taking the place of the endothermic steam reaction. The selection of a gas for a fuel cannot be made on the basis of heat units only; the selection should be made upon the basis of heat units absorbed by the process or the furnace.

(Part III—Conduction of Producer Fuel Tests, will appear in an early issue.)

Crude Liquor as Manure

If any development can be undertaken successfully in this country along the lines indicated in the following item and thereby furnish a new channel for disposal of gas liquor, it ought to be very welcome. Obviously American conditions are quite different from those abroad in that our fertilizer industry probably can handle such materials with comparatively greater efficiency than gas companies, in view of the high labor costs involved in America. Nevertheless, this idea of using crude gas liquor on the land may be one worthy of some attention by this country's interests.—Editor.

IN an address to the Silesian District Gas Association, Herr K. H. Raupp, of Görlitz, said that in Germany nitrogen prices had fallen so low that he did not think there was a single gasworks recovering ammonia at a profit. Burkheiser's process had not yet come to much, and as the liquor must be disposed of somehow, there seemed nothing for it but to give out the liquor as a manure at a minimum profit.

Though gas liquor has been in use as a manure in the Baden-Baden and Rastatt districts for twenty years past, agriculturists are still afraid of the sulphuretted hydrogen, cyanides, sulpho-cyanides and phenols present in fresh crude gas liquor. They have an idea that in the course of time the needful bacteria will be killed out of the soil.

The Görlitz gasworks, in addition to interesting a number of small farmers in the question and supplying them with liquor gratuitously for experimental trials, has enlisted the co-operation of the Görlitz Agricultural School in a series of comparative tests made in the field. In these tests, the liquor was applied at a strength corresponding to 1 per cent. of nitrogen. Alternate strips were manured and left unmanured. The results were:—

Hay land, never before manured: Ten grms. of nitrogen were applied to the manured strips per square metre (121.165 grains = 0.277 oz. nitrogen per square yard). There was apparent damage to the crop at first, but in a few days the growth was great. On cutting in June, the crop was 2½ times as great as in the unmanured strips. The moss was entirely absent. Then there was a second sprinkling with half the quantity of nitrogen. A dry season followed. On cutting at the middle of September, the unmanured strips gave 0.45 times the former crop and the manured strips 4.3 times as much. These results were confirmed by farmers in the neighbourhood of their own fields.

Other crops.—After digging up, the ground was sprinkled to the same nitrogen quantity as above. The weather was rainy. After some days the beds were made up and were sown at different times.

Oats.—Sown mid-April. The sprinkled beds gave 2.4-fold in grain and 1.55-fold in straw.

Mangel-wurzel.—Sown mid-April. Gave a 1.3-fold yield; roots long and taperings, as against short and branched.

Carrots.—Sown mid-April. More than 1¼-fold yield.

Spinach.—Sown mid-April. 2½-fold.

Red Cabbage.—Sown mid-May. No result; no heads formed.

White Cabbage.—Sown mid-May. A 1.6-fold yield; heads 4½ lb. against 2.83 lb.

Beetroot.—Sown mid-June. A 1.65-fold yield of bigger roots.

The object of the above tests was not to obtain maximum yields. For that purpose nitrogen manuring alone would not suffice. The object was to show that gas liquor could be used as a nitrogen fertiliser.

Much depends on how near the land is to the gasworks. Already many gasworks are getting rid of their liquor in this way from September to May.

Concentrating 300 c. metres of liquor to a 22 per cent. concentrate results in a loss of £6 5s.; the same can be sold off to farmers for £11 5s. It is always necessary to inform the farmers to what extent they will have to dilute the liquor before applying it to the soil. It is well, on introducing liquor for the first time, to supply it for half a year gratuitously. If the dilution be carried on at the gasworks, this will simplify matters, save the farmer trouble and enable a uniform charge to be made for liquor.

—*The Gas World*

Lack of Interest — A Liability

THE operating force is just as important a factor in the development of sales expansion as advertising and almost as important as the salesman. Day after day a portion of the operating force comes in contact with the public. By this contact is established ill will or good will. Carelessness, lack of promptness, and disagreeableness will all tend to make the public feel that the gas company is not interested in the important affairs of the individual. On the other hand, promptness, kindness and care will develop good will and create in the mind of the customer a desire to be of service to the company.

It is one of the lamentable facts that the rank and file of gas company employees and even some of the executives, do not reflect this attitude of interest and desire to serve that exists in the mind of every executive who has at heart the development of his business. This lack of interest and of good service in a large part negatives any advertising or sales campaign for there is no better salesman than a pleased gas consumer. There is no greater sales resistance than that created in the mind of a displeased gas consumer.—*N. H. Gellert before Meeting of Md. Utilities Assn.*

Coke Oven Operation and Maintenance

F. J. PFLUKE
Rochester Gas & Electric Corporation

(Continued from October Issue)

IN THE first article of this series the subject of oven brickwork maintenance was covered, and it was pointed out that for long life and efficient operation, careful inspection and maintenance is absolutely essential. To accomplish this aim it is equally essential that the auxiliary oven equipment be kept in continuous operation. Delays due to breakdowns of auxiliaries result in inefficient operation, and if very frequent and of long duration are apt to prove injurious to the oven brickwork. To insure continuous operation of auxiliaries and minimize the duration of delays systematic inspection, lubrication, careful maintenance and a stock of essential spare parts is necessary. In this article we shall try to point out important items of inspection and maintenance.

Lubrication of Equipment

Perhaps the most important item to be considered in the economical and continuous operation of oven equipment is conscientious and adequate lubrication. Proper lubricants used correctly will do much to eliminate breakdowns. Because of extreme temperature conditions encountered around coke ovens the selection of proper lubricants is of prime importance. Many greases have a high "soap" content which is extremely objectionable in excessive temperatures. It will be found that the oil will melt out of the bearings or pipes leading to the bearings leaving the "Soap" which will clog the pipes preventing grease from reaching the bearings. It is the writer's experience that in general two grades of grease should be used. One should be a grease of good quality suitable for normal condition of hot and cold. A grease of the following analysis has been found to give excellent results.

Air melting point	203°-212°F
Moisture	1.0%
Ash	0.82%
Mineral matter	0.22%
Soap (Calcium stearate)	6.47
Oleic acid	0.47
Corrosion	None

The other grease should be one with a high melting point for use in places of extremely high temperature. The following analysis is one of a grease which has given excellent service in extremely high temperatures.

Air melting point	347°-365°F
Moisture	0.2%
Ash	2.83%
Mineral matter	0.31%
Soap (Sodium stearate)	14.57%
Oleic acid	0.54
Corrosion	None

It will be noted from this analysis that the soap content of the high heat grease is considerably higher than is recommended for general use. However the soap base in this case is sodium stearate which does not separate from the oil under high temperatures as does the calcium stearate and consequently is not objectionable.

It must be remembered in selecting a grease that when one of a satisfactory analysis is found the actual operating results should be carefully watched before assuming that the grease is entirely satisfactory. Very often greases of the same analyses will give entirely different results under actual operating conditions. In general it may be stated that for satisfactory lubrication of oven equipment the total percentage of inert material, which includes calcium stearate or soap, ash, moisture, should be lower than 12%. In other words, the total lubricant should amount to at least 88% of the same grease except in the case of high heat grease which requires a higher percentage of sodium stearate.

A good grade of motor oil should be selected for motor bearings. It has been found advisable to use two grades of motor oil, one for summer and one for winter use. Because of the extreme heat a heavy body motor oil must be used for summer which if used in winter becomes so viscous that the oil rings are unable to pick up the oil and burned out bearings are apt to result.

Oil for Gear Cases

Likewise, oil for gearcases should be carefully selected. Here also, two grades of oil should be used. For summer use cylinder oil has been found to give good satisfaction. Although more expensive than other grades of oil which might be used, cylinder oil will give better protection to the gear teeth due to the tallow constituent which sticks to the teeth and resists the excessive pressure. For winter use this oil must be thinned out, otherwise it will become so viscous as to make it impossible to move the equipment. Thinning may be done with a good grade motor oil.

For journal boxes a cheap car oil used freely will give satisfaction.

For open gears and cables a special gear and cable grease should be selected.

After the selection of proper lubricants it is important that the various grades selected be used in the proper places. To eliminate the possibility of confusion a chart should be posted in the oil room listing the lubricants used. Such a chart is shown in figure 1.

To insure efficient lubrication all bearings should be properly fitted with grease cups or pressure gun connections. It is strongly recommended that a pressure

gun system be used on coke oven equipment. The use of an open grease pail to fill grease cups results in considerable coke dust entering the bearings. Some bearings may require grease at intervals between the inspection periods of the regular oiler. These bearings should be equipped with grease cups fitted with pressure gun fittings through which the cups may be filled.

OVEN LUBRICATION

The following lubricants are to be used for oven equipment.

1. ____ pressure gun grease in all bearings which are not subject to abnormally high temperature.
2. ____ high heat grease in all bearings subject to high temperature (all coke side equipment)
3. ____ cylinder oil in all gear cases - Summer use.
4. ____ motor oil in all gear cases - Winter use.
5. ____ compressor oil in all flexible couplings.
6. ____ compressor oil in all oil bearings subject to high temperature.
7. Turbine oil in governors.
8. Car oil in journal boxes.
9. Heavy cup grease in drive gear cases on coal larries.
10. Gear compound on all gears not enclosed in oil tight cases.
11. Cable compound on all cables.
12. Motor oil in all motors.

Figure 1

Bearings which are in inaccessible places should be fitted with grease pipes making the greasing operation as easy as possible. It is also recommended that the grease gun be filled by means of a grease pump which may be attached to the grease barrel. This will also help to prevent dirt from contaminating the grease.

Many bearings on the operating equipment tend to throw grease which falls on the floor causing a slipping hazard. This may be remedied by drilling the bearing housing for cap screws and fastening gasketed plates onto the housing covering the shaft ends. Figure 2 shows a pusher gear case fitted in this manner.

Figure 2

In a small plant operating on a slow coking time the lubrication is usually done by the operators. In a large plant an oiler is necessary. He should be a reliable man with some mechanical sense and should be trained to inspect the equipment while performing his duties. To minimize the possibility of neglecting some greasing point it is recommended that a greasing chart be posted on each piece of equipment. This chart should briefly describe the lubrication to be done on the piece of equipment. Fig. 3 shows such a chart for a door machine. The frequency of lubrication should be determined by careful inspection and then indicated on the chart.

The routine of lubrication should be rigidly adhered to. All bearings should be well supplied with grease. Motor bearings should be washed out with kerosene frequently and then supplied with clean oil. Journal boxes should be repacked with wool waste and car oil frequently especially the bearings subject to extreme heat from which the oil will be found to vaporize rapidly. Gear cases should be kept full. All cables should be painted with cable compound frequently in order to keep any moisture from the core. If the lubrication is not neglected the necessity for repairs will be greatly reduced.

DOOR MACHINE Parts to be lubricated	Number of Times per Week
Four Journal Boxes on Wheels	1
Blower and Motor Bearings	6
Eight Alemite Connections on gear Reducer for Door Hooks	1
Two Bearings Door Hook Motor	6
Thirteen Alemite Connections on Door Hoist Arms	1
Flexible Coupling on Door Hook Motor	1
Flexible Coupling on Door Hoist Motor	1
Two Bearings Door Hoist Motor	6
Oil in Speed Reducer for Door Hoist	1
Two Alemite Connections on Bearings of Piston Gear Shaft for Door Hoist	1
Oil in Reduction Gear Box	1
Two Bearings on Drive Motor	6
Flexible Coupling on Drive Motor	1
Oil on Brake Mechanism	1
Six Alemite Connections on Speed Reducing Gears & Shaft	1
Operating Parts on Pantograph	1

Figure 3

In addition to proper lubrication careful inspection of all apparatus and correction of difficulties, before they become serious will do much to reduce maintenance costs and insure continuous operation. A competent mechanic should carefully inspect all equipment. The frequency of inspection will depend on the operating schedule. We shall outline briefly the most important items to be inspected on the various equipment.

Pusher Inspection

The pusher is subject to the greatest strains and most severe wear of any of the oven equipment and should be carefully watched for trouble. The most important parts which should be rigidly inspected are as follows:

1. The pusher ram should be carefully inspected for warping. If, due to power trouble, the ram remains in an oven long enough to heat it appreciably, warping may result. Such a condition should be corrected immediately, otherwise the oven walls are apt to be damaged due to rubbing of the ram. The ram shoe which transmits the weight of the ram to the oven floor while pushing should be carefully checked for wear and shims added when necessary. The clearance between the ram shoe and oven floor as the ram enters the oven should not exceed ¾ inch. As the ram leaves the last guide roller and all the weight is transferred to the oven floor

there should be no sudden drop of the ram head. At some plants the constant dropping of the ram head onto the oven floor due to failure to compensate for wear of the shoe has resulted in broken floor brick. As every operator knows the wear of the pusher shoe is very rapid. This wear can be practically eliminated by coating the shoe with a metal called Stellite. This material comes in the form of a welding wire and is flowed onto the surface with a welding torch. The Stellite is extremely hard and a shoe so treated should last indefinitely, it merely being necessary to Stellite at intervals.

2. The ram overload relay should be tested at least once a month. It should be set to "kick out" under a load slightly higher than the maximum normally required to push an oven. If the relay fails to work properly there is danger of pushing out an oven wall in case a charge fails to move under normal load because of some unusual condition. The overloads may be tested by running the ram against a pinion wall and noting the current required to kick out the relay. Any necessary adjustment may then be made.

3. The ram drive should be carefully inspected. This inspection should include the flexible couplings, gears and all keyways.

4. The leveling bar must also be kept true or damage to the oven walls may result. It is well to periodically run the leveling bar through an empty oven and observe the clearance between the bar and walls. The leveling bar cable should be inspected for wear and should be changed if broken or badly worn strands are found. If a cable breaks with the bar in an oven severe warping of the bar is apt to occur.

5. The door hooks should be frequently checked for adjustment to be sure that both hooks are carrying the weight of the door. If due to improper adjustment, one hook carries all the weight it may break. The hooks are also subject to severe wear which may be greatly reduced by coating with Stellite in the same manner as described for the pusher shoe.

6. All bearings, shafts and gears should be carefully inspected and renewed when necessary.

7. All electrical equipment should be thoroughly cleaned and tested for grounds at least once a month. Contacts should be filed, any badly burned ones renewed and all coated with vaseline. All motors should be inspected frequently and cleaned of any dust or grease. The commutators should be cleaned and when badly burned should be turned down on a lathe.

8. All brakes should be tested and any burned or worn linings renewed.

9. It is extremely important that the pusher track be kept in excellent condition. Special care should be taken to maintain the track perfectly level in order that there may be no danger of the machine rolling after having been spotted for pushing.

Door Machine and Coke Guide

The routine inspection of the door machine and coke guide is very similar to that of the pusher. However, due to the proximity of this equipment to the heat and because of the extreme dust conditions under which it operates, much closer attention must be given to the bearings. Adequate lubrication of all bearings is absolutely essential to continuous operation. The most important items of inspection and maintenance are as follows:

1. The door hooks require the same attention as those on the pusher. They should be carefully adjusted to set the door in place properly without dropping it which may cause breaking of the cast iron frame.

2. The journal brasses should be carefully watched and renewed when excessive wear has taken place. This is extremely important because of the close clearances between the door machine, coke guide and ovens buckstays. If badly worn brasses are not renewed the equipment is apt to strike the buckstays causing severe damage. The importance of checking this clearance frequently is quite apparent. Likewise, the clearance between stops on the buckstays and top of the coke guide, which prevents the guide from being tipped over in case a charge should be accidently pushed against the guide while improperly spotted, should be closely watched. Insufficient clearance may cause derailing of the equipment or serious damage to the guide.

3. The wheel flanges of the door machine and coke guide are subject to considerable wear and new wheels should be installed when the flanges become thin enough to break. Worn flanges may be built up by electric welding and the wheels used again.

4. The coke guide straps and liner plates should be renewed when badly worn or warped and should always be maintained in good condition so as not to catch the coke charge.

5. The wiring and electrical equipment of the door machine because of the heat and dust must be frequently inspected and cleaned. The insulation of the wiring should be carefully watched and new wiring installed when the insulation becomes unsafe. To avoid serious delays and the possibility of damage to oven equipment it is essential that electrical troubles be reduced to a minimum and when they do occur the difficulty should be located and remedied as rapidly as possible. To assist the electrician in the speedy location of electrical troubles it is recommended that a simple and complete wiring diagram of each piece of equipment be framed and posted on the equipment.

Clay Car, Coal Larry and Coke Car

1. Like the door machine the clay car requires careful attention to the running gear and clearance between the equipment and buckstays. Clearance between the clay car and pusher should also be watched very carefully to avoid the possibility of the pusher derailing the clay car and perhaps throwing it off the platform.

2. The running gear and electrical equipment are the chief items of maintenance on the coal larry. The running gear is subject to intense heat and should be provided with adequate lubrication to prevent excessive wear.

3. The journal boxes and springs of the hot coke car should be checked daily. This equipment usually operates at a high rate of speed and because of small clearance allowed a broken spring or worn bearing is liable to throw the car against the coke side platform causing serious trouble. The brakes of the coke car should be tested daily and maintained in first class condition at all times. If compressed air is used in operating the brakes and doors the piston leathers in the operating cylinders will require frequent attention. Leaking leathers put an abnormal strain on the air compressor and use considerable unnecessary power. The iron work of the coke car should be painted frequently to protect it against corrosion by the quenching water. The coke car track should be gauged frequently, ties kept in good condition and reballasting done whenever necessary to keep the track level.

Reversing Equipment

Much of the inspection and maintenance of the heating equipment including the reversing mechanism, and

gas and air regulating equipment is performed by the heaters and this work will be covered in a subsequent article. There are a few items of inspection of this equipment which should be cared for by the mechanics.

Because of the absolute necessity for continuous functioning of the reversing operation all electrical equipment should be checked at least once a week by a competent electrician. The reversing machine gears and bearings if properly lubricated should require no further attention. The reversing cables should be carefully inspected and lubricated. All cable clamps should be kept tight.

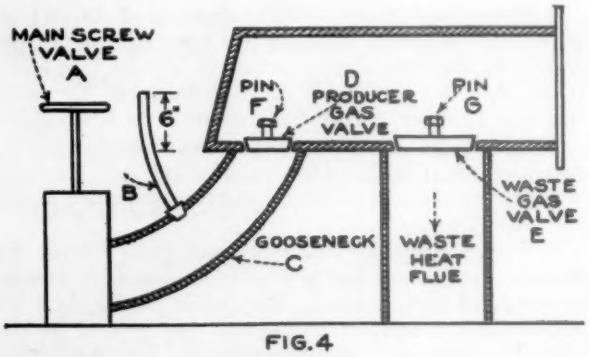


FIG. 4

The producer gas and waste gas clapper valves should be examined frequently to be sure they are seating properly. It is very important that the producer gas valves seat tightly otherwise considerable gas will be lost by leakage into the waste gas flue. Referring to fig. 4, the producer gas clapper valves may be tested effectively by first closing the main valve "A" on the box. Then screw a piece of 1 inch pipe long enough to project about 6 inches above the level of the clapper valve into the hole "B" which is usually provided in the top of the goose neck. Next fill the goose neck "C" with water after seating the clapper valve "D." Put in enough water to fill the pipe, which will put 6 inches water pressure on the clapper valve and water will leak through if the valve is not seating properly. It may then be ground in with grinding compound until tight.

The pins "F" and "G" shown in fig. 4 by which the producer gas and waste gas clapper valves are operated. are subject to considerable wear and should be examined frequently and renewed when necessary.

All reversing cable sheaves and supports should be examined frequently. The bolts fastening the sheave supports should be kept tight.

Spare Parts

To reduce the duration of delays due to breakdown of oven equipment an adequate supply of spare parts should be carried in stock. There should be spares for all important parts which are subject to wear or which could not readily be repaired in case of breakage. It is recommended that the spares be carried in stock for all bushings and pinions. There should be a spare for each type of motor and spare coils to make motor repairs.

The outline of inspection and maintenance which has been presented has been followed very closely at Rochester and during the five years of oven operation there has not yet been a serious delay due to failure of any oven auxiliary equipment.

Future Home Comfort

VIEWING the art of heating homes as it is today, the author cannot but feel that the zenith of present methods has been approached. A point has been reached where its defects are being recognized, where the demand for human comfort and even luxuries outweigh considerations of cost. It is for this reason that the author predicts a rather abrupt change within the next 50 years in the method of obtaining bodily comfort in homes. Inevitably it will be some form of air conditioning equipment which will provide equitable heat in the winter with the proper degree of moisture and thorough cleanness of the air in the rooms as well as reasonable ventilation. It should be possible readily to cool homes in summer, to reduce the enervating humidity on sultry days, and to sleep soundly in cool bedrooms at night.

It is quite possible that gas will be the coming fuel because of its cleanliness, ease of regulation, and its real economy of raw material and transportation. It may be that electricity in some locations will also play its part, especially in connection with the application of the reversed refrigeration cycle.

In any event, it seems inevitable that some day the average householder will be able to press a button in winter and produce a climate in his home rivalling the pleasant days of Florida, and press another button in summer to bring the invigorating and bracing air of the mountains and seashore to his abode.—*W. H. Carrier, before Michigan Chapter, A.S.H.V.E., April, 1930.*

Setting A Good Example

NOW is the time to make purchases of materials and supplies for future requirements, according to John E. Zimmermann, President, The United Gas Improvement Company, who believes that business conditions and prices have reached the turning point upward, which will make purchases at a later date less favorable.

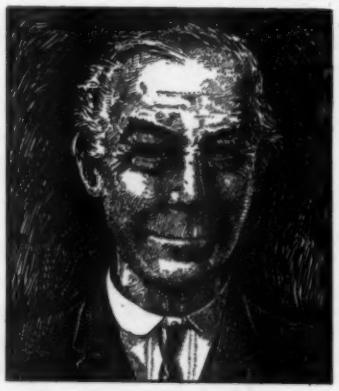
The best way to restore public confidence in business and bring about a prompt revival of trade in all lines, Mr. Zimmermann believes, is for large purchasers to go into the market and buy now. Supporting this belief he recently addressed a letter to the local managements of all U. G. I. subsidiary companies in which he suggests that they at once anticipate their normal requirements for several months and place the orders. His letter follows:

"I am advised by our Purchasing Department that prices have reached a level which justify us in placing our orders for normal requirements.

"It is felt that the purchase of materials can be made advantageously at this time and that improvement in business conditions may make later purchases less favorable. Business conditions in this country are essentially sound, and I look for a steady and gradual improvement.

"I suggest, therefore, to assure your ability to render prompt service to your customers, when the change comes, that you immediately estimate your needs for such construction and operation materials as you will require during the next several months and place your requisitions for them with the Purchasing Department."

Letters from a Gas House Terrier to His Grandson



Dear Sam:

So the anvil chorus has been performin' under your winder again,have they? You don't say so, and I didn't hear 'em, but I sure noticed their echoes in your last. Right after I had writ you in August about layin' off the Wailin' Wall too!

In brief, you pass on to me the current yelp that natural gas is fixin' to run the manufactured article out so fast that they ain't nothin' but slow music and a nice notice in the papers left for the boys in the latter industry. Which comes under the head of interestin' if true---and reminds me of the gloomy days in the electric light industry when it was young.

You ain't old enough to rickollect the old carbon lamps, which was about as efficient as a red-hot stove in lightin' a room at night. In fact, the principle was pretty much the same, and the results and cost not much better. While the amount of current that one of them babies lapped up was what made an electric light company common stockholder git out and emit loud joyous whoops on the lawn. Why, Sam, if a' electric company had six customers all happenin' to be burnin' them lamps simultaneous, they put on extry firemen at the power house and extry clerks in the billin' department; while the fire department stood by to wet down the meters when they got too hot from overwork

Then the blow fell. Like now, it was first whispered darkly behind closed doors, and then openly admitted in the gloom of the ante room to the nearest bankruptcy court that Progress had done pulled another boner: that the new tungsten lamps would reduce current consumption and spell the sad end of a' infant industry. Seven electric company presidents was subsequently injured tryin' to hold their places in the bread-line that was formin' on the left. And only here and there one with wit enough to see that lowerin' costs and increasin'efficiency was fixin' to give volume a boost that would make a giant out of what wasn't nothin' more'n a' atom, comparatively speakin', then. Until now it is sellin' more output and employin' more men than them old boys could even dream of with the help of hasheesh and three shots of heroin!

What you youngsters that are headin' for the top of the gas bus'ness has got to keep before you is that they is a future ahead of it that'll match the growth of the electric industry--and so close to you now that you've got to hustle like a rabbit in front of a forest fire to be ready before its on you. "He was a good man 'til Progress run over him" don't look good on

nobody's bus'ness tomb-stone.

The main point then won't be whether man or Mother Natur' made it-- the big thing'll be that it's gas. And it's goin' to take both kinds, and more of it than you half dream yet, to furnish it in the volume this future'll be callin' for.

And, takin' another leaf from the electric book, hydro-electric power aint put their generatin' plants out of bus'ness yet. Dotted all over the country is stand-by steam plants. Let the water or the lines go down, or the load go up, and them plants swings into action like a fire department on a down-town third alarm. That's why one gas company that I know--one that didn't drop a man they wanted to keep when they changed over to natural gas--has instructions out for them men to drop anything except a case of dynamite when a certain whistle blows, and rush to the generatin' stations to start the works on supplementin' interrupted or wanin' natural gas supply.

Normally, them men were just switched to other departments, like distribution, where tremenjous increases in construction has already begun in the wake of more or lower-priced gas.

Of course, the future aint so rosy for the lad that has congealed in his job and can't get he't up enough to be poured into a new mold. But then a chap like that never had no future to start with. He just had a present, and even that is fast fixin' to turn into a past.

So, Sam, I would prescribe for any incipient false alarms like yours a brisk dose of sulphur and molasses, follered by a railroad ticket to Atlantic City this month. Where you'll get away from calam'ty-howlers and git to rubbin' minds and elbows with the fellers that's on their toes, holdin' down their jobs with one hand and reachin' for the rung above 'em with the other. With time to play a little still left on the side.

Spend a lot of time lookin' at the exhibits, so you'll at least know something about the last word and the next whisper in the tools you've got to work with. Rememberin' at the same time not to be the first man to adopt a new thing or the last to drop the old.

Then sit in on as many sessions and papers as you can. Read and listen to fellers that know more'n you do--'specially if they're talkin' about something that's in the gas field but outside your own job right now. For as you go up you've got to know something about everything in gas just as well as a whole heap about the one p'ticular thing you're doin' at the time.

You see, son, you've already about reached the point where more and more you've got to get your results through the men under you now. It's how you handle them that spells success or mediocrity for you from now on. For if you don't know his job, by just that much you won't know your own. So I'm preachin' broadenin' out and the impossibility of knowin' too much. I want to see you dodge the danger of knowin' too much about your own department at the expense of pickin' up too little about the others. So,

Yours for a fast mile on the Boardwalk yet!

Monoxide Mike

AT THE A.G.A.

the EMCORECTOR

and the EMCO ORIFICE METER

You are cordially invited to see these products at our Booths 225, 226, 301 and 302 at the Convention Hall, and to visit our headquarters at the Hotel Traymore during the A. G. A. Convention.

PITTSBURGH EQUITABLE METER COMPANY

Main Office and Works—Pittsburgh, Pa.

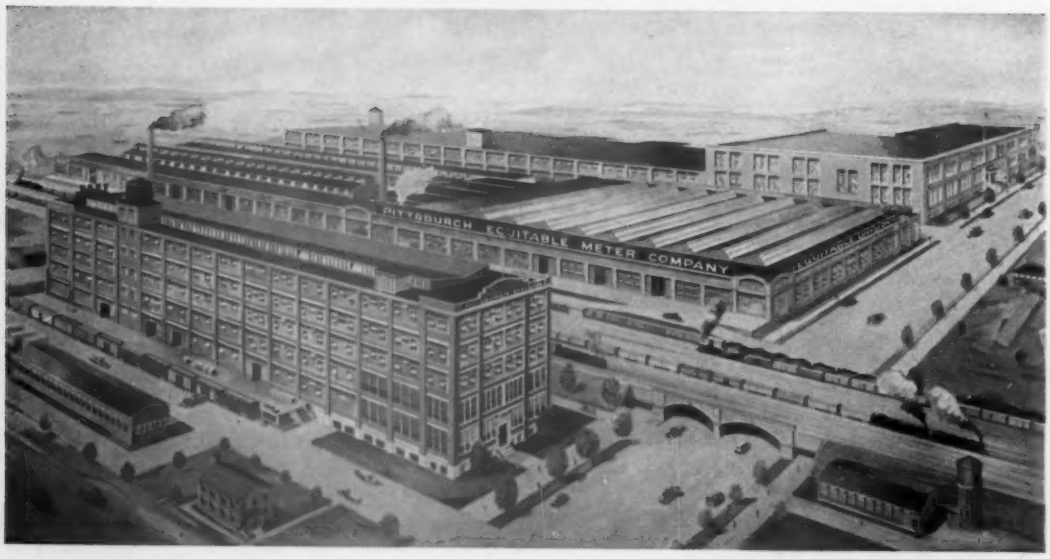
New York	Tulsa	Los Angeles	Seattle	Kansas City, Mo.
Chicago	Dallas	Salt Lake City	Houston	Columbia, S. C.

1886

Manufacturers of the largest and most complete line of meters and pressure regulating equipment in the world.

EMCO

1930



PITTSBURGH EQUITABLE METER COMPANY

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XIV--Space Heaters

A SPACE heater is an appliance installed in a room and intended for heating the room or rooms. Many styles are manufactured, which vary principally in design, size and ornamental treatment. Individual space heating appliances embrace those appliances which are self-contained and require only a connection to a gas outlet and in some cases to an existing flue. A classification of these heaters follows:

Radiant Heaters
Reflector Heaters
Log Heaters
Gas Steam Radiators
Gas Hot Water Radiators
Gas Warm Air Radiators
Warm Air Heaters

Radiant Heaters

These may be divided into two groups; the open yellow gas flame type radiating energy directly into the room, and the blue flame type which creates radiant energy by passing through or impinging on refractory material. The former type consists simply of a group of yellow flame burners encased in a screened or latticed sheet iron chamber of sufficient height to prevent carbonization. All the air for combustion is mixed at the burner tip, producing the conventional flame of the open flat flame burner.

Fig. 1—Coal Basket

The blue flame radiant heater is now the prevailing type of space heater. It consists usually of a rectangular sheet iron body finished in brass, aluminum or black, open in front and supported on legs. Near the base is an atmospheric burner or group of burners with drilled, slotted or grid ports. Resting against the rear of the body is a large slab of refractory material, usually separated from the back of the heater body by an open air space. The flames pass through open radiants of fire clay which become incandescent, radiating heat rich in health giving rays. No standard design is used for all heaters, so particular care should be taken to insure the use of the correct radiant for each heater. The radiant heater is sold in many styles to agree with period furniture and harmonize with different modes of decoration.

Radiant heaters are either portable or fireplace heaters. The former should be of lighter weight to permit carrying from room to room and must be supplied without a control cock.

Reflector Heaters and Log Heaters

In the case of reflector heaters the radiation from the flame itself is reflected into the room from a polished metal surface, usually copper, that is corrugated or fluted. They are of the yellow flame open tip type with the burners located either above or below the reflector.

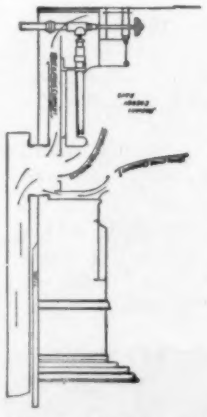


Fig. 2—Cross section, Radiant Heater and Flue

In an attempt to imitate the wood fire on an open hearth many varieties of so-called gas logs were constructed. They were made of "terra cotta" with here and there a little loose asbestos fibre to "liven up" the yellow luminous flames. The logs were hollow and had openings scattered about on the front side. Objections to this type of heater arose due to clogging up of the hollow channels and exit holes and the deposition of carbon on the log causing imperfect combustion and objectionable odors. The usual base and burner assembly of the radiant heater with clay "logs" through which the flame can be seen has now replaced the older luminous type.

Coal Baskets

The goal of many manufacturers has been to imitate the appearance of the glowing coal or coke baskets such as are found where Cannel or a large lump gassy coal is available. The early attempts were unsafe or unsatisfactory for the same reasons that ruled out the logs. By adopting the radiant principle and confining the flame and combustion to vertical channels, complete safety was achieved and the black lumps of refractory material scattered in front and on top soon take on a bright glow which simulates exactly the natural coal basket.

Installation

All heaters bearing the Laboratory Seal of Approval burn gas completely without production of carbon

monoxide, so that flue connection is unnecessary although from other considerations, desirable. The fire hazard requirements, rigid as they are, also are met by all approved heaters. The appearance of a radiant fire is by far the best when in a fireplace setting and this should be followed if possible. When installed in a flue connected fireplace the heater ventilates the room at the same time that heat is being produced, with only the heat in the products of combustion escaping. Fig. 2 shows a section of a heater so installed. Imitation fireplace settings are widely sold for mounting heaters and creating a circulation of air, adding convection heating of the hot products to the radiant heat. The various parts of one of these assemblies are shown in Figs. 3 and 4.

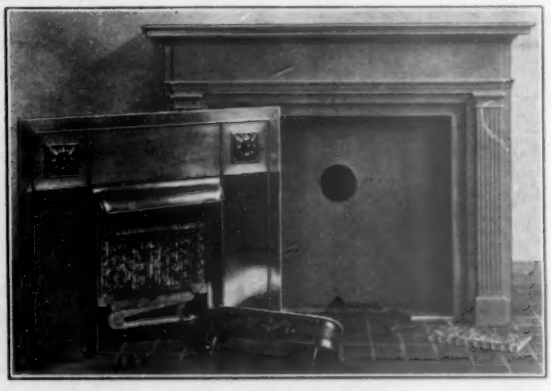


Fig. 3—Mantel and Heater

Ventilating heaters similar in design to the heater of this assembly are used for wall installation in which the body is set in the wall with suitable insulation on all sides. A front plate is set flush with the plastered wall and a ventilating flue carried outside.

Gas piping to any heater installed in living rooms should be run solid to the heater with only one control cock in the line just ahead of the gas orifice. A convenient shut-off cock should be installed in the line but used only for permanent shut down. In cases where portable heaters are used, the heater must be without any control device, but equipped with a nozzle for approved flexible gas tubing. The control cock preferably of the locking type must be on the solid piping.

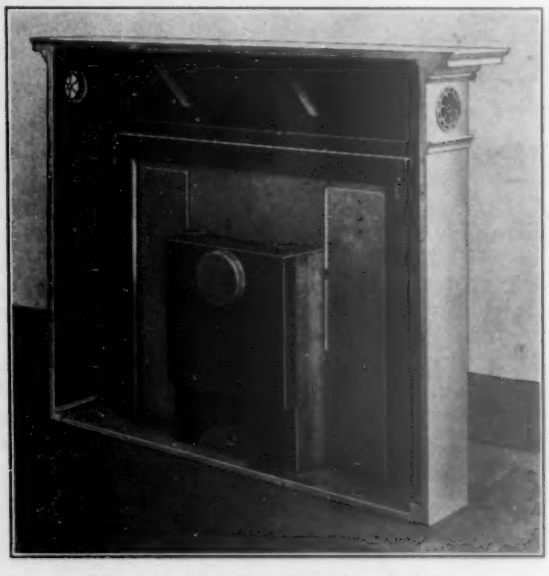


Fig. 4—Rear View, Mantel and Heater

The size of a radiant heater is based on the number of "radiants." Each "radiant" represents a burner capacity of 3 cu. ft. of 540 B.T.U. gas per hour. A ten radiant heater has on this basis a burner capacity of 30 cu. ft. As all radiant heaters are primarily used for auxiliary heating, conversion of the gas capacity into terms of equivalent radiating surface is unnecessary.

All sources liberate heat in at least two forms; radiant heat and convected heat. Radiant heat depends on the temperature of the heating element, being in accordance with the Stephan Boltzmann law that radiant energy is proportional to the fourth power of the absolute temperature. This means that the radiant energy increases many times faster than the actual temperature. Convected heat is produced by air passing through the heating element becoming heated and circulated, and depends on the amount of air circulated and the amount of heating surface. At the temperatures usually encountered in the radiant heater, approximately 30% of the heat is present as radiant energy, and 70% as convected heat. When flue connected the losses are approximately 25—30% of the total heat.

Gas Steam Radiators

A popular type of heating appliance is the Gas Fired Steam Radiator. This is similar in general appearance to the radiators used on a central house heating steam system except that a separate combustion chamber is provided below the sections. An atmospheric one-piece bar burner is located in this chamber. A cap is provided near the base of the last section for partially filling the radiator with water. A vacuum valve and pressure relief valve are included. The radiators are made in numerous sections and heights and correspond with the accepted cast iron radiator design.

Gas steam radiators are controlled by automatic control of the gas supply. Two methods are in common use, the first by the action of steam pressure; the second by the action of water temperature.

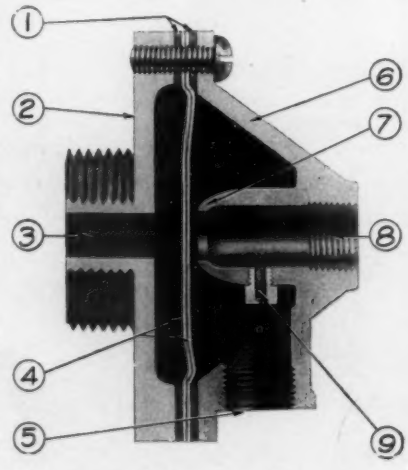


Fig. 5—Diaphragm Regulator for Gas Steam Radiator

In the first case the volume of gas supplied to the burner is controlled by an automatic regulator actuated by the pressure of the steam in such a manner that when steam has been generated in the radiator to from five to eight pounds pressure the volume of the gas is automatically reduced so as to allow only sufficient gas to be supplied to mantain the correct pressure.

This insures a minimum amount of gas being used to keep the radiator hot and maintaining an even room temperature. It prevents the wasting of the gas, and the overheating of the radiator and room.

In this type control, two orifices are used, a constant by-pass and a regulated main orifice. The capacity of the by-pass is about 25% of the maximum and is sufficient to supply just enough gas to maintain a steam pressure up to 8 lbs. in the radiator. The flow of gas through the main orifice is regulated by a double metal diaphragm which seats against the *gas* orifice as *steam* pressure increases, but is normally open with little or no steam pressure. The double metal diaphragm precludes the probability of complete rupture of the controlling medium and flow of steam at a few pounds pressure back into the gas line at only a few ounces pressure. The control is rugged, sensitive and reliable.

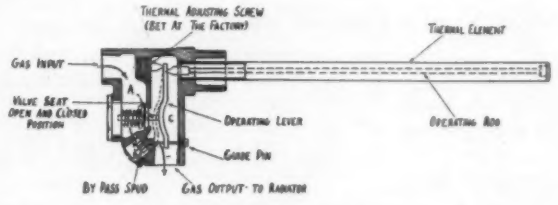


Fig. 6—Temperature Regulator for Gas Steam Radiator

Control by temperature of the boiling water makes use of a thermostat similar to the oven regulator. The expanding element cover is copper tubing, the non-expanding internal rod a steel alloy ending in a pivot point. As the temperature increases this pivot allows a spring attached to a valve piston on the far end of a lever to close against the valve seat. Gas always by-passes the valve through a fixed orifice. The adjustment of the lever arm, valve seat and thermostatic element is for complete shut down at 242° F. even though water is entirely missing from the radiator, (the boiling point of water at 11.1 lbs. per sq. in. gage.)

Standard types of room temperature regulators can be applied as an added refinement which at times may be desirable but not imperative.

Because of the constant by-pass to a minimum value these appliances are exempt from the absolute necessity of flue connection. There are occasions when the elimination of condensation or local requirements require flues to be run.

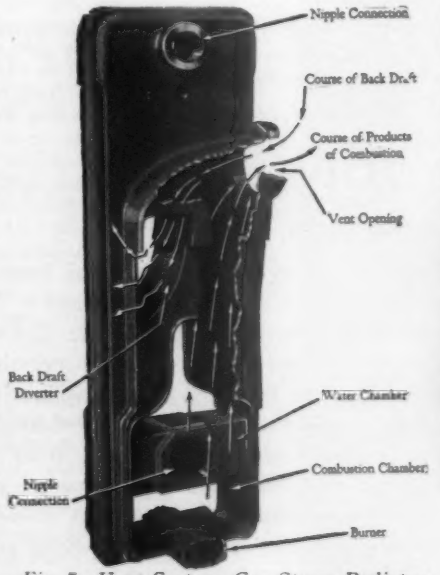


Fig. 7—Vent Section, Gas Steam Radiator

For this purpose, vented radiators are available, in which a special center section is provided with a built-in draft hood and external flue collar for connection to the flue pipe.

Gas steam radiators can be used in place of the conventional radiators as part of a central heating system. They can serve as the main source of heat during spring and fall and receive steam from the boiler in the heavy heating months. In all night stores, telegraph offices, cigar stores, lunch rooms, etc., which receive heat from central heating systems during the day only, the gas radiator serves the dual purpose by being lit when the central plant is shut down in the evening.

An oversized gas radiator can be connected with ordinary radiators for supplying heat in small rooms. The steam generated passes through the system as in any one pipe system. Such combinations work best when the added radiation does not exceed 50% of the gas steam radiator.

Hot water radiators similar to the steam radiators are supplied with thermostats instead of pressure regulators and operate at temperatures of 160°-170°.

Gas steam radiators are rated in sq. ft. of equivalent radiation and should be selected from heat losses as outlined in the Chapter on Central Heating Appliances.

Warm Air Radiators

These in the past were usually sheet iron or pressed steel and the older types used a luminous flame burner without automatic control.

The modern development is the production of a cast iron section radiator encased in a decorative jacket much like radiator covers. A thermostatic control of the expansion type with by-pass controls the gas supply.

Cabinet Heaters

Cabinet heaters for room installation are in reality miniature warm air central heating plants, representing a capacity equal to one burner of a sectional type furnace. By using the cabinet heater, ducts are eliminated and radiation through the heater jacket aids in supplying heat. Without the disadvantages of the room size coal stove, the warm air heaters bear the same relation to the gas warm air furnace that the coal stove does to the coal furnace. It is a special purpose heater, not used for auxiliary heating in the same way as radiant heaters, but for complete heating, generally on an intermittent basis.

These heaters have internal heating surfaces in which air passes within and outside a corrugated drum carrying the products of combustion. The air circulates through the heater by gravity and starts gentle currents of warmed air in the room, heating chiefly by convection, hence the name "circulator."

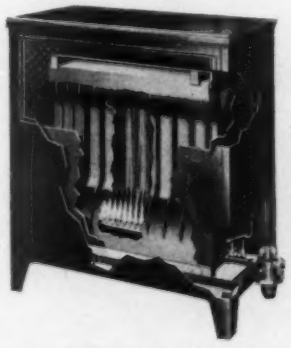


Fig. 8—Sectional View, Cabinet Heater

Burners of the usual bar type heat fire clay radiants which emit radiant heat through mica windows, giving an additional quantity of direct heat.

The cross sectional view shows the construction of one design. The burner is a complete casting with venturi mixer and supporting lugs. Above the burner are the radiants which act as heat reservoirs and slowly give up this heat to the cool air entering through the louvres which are shown at the side and are quite high off the floor. The flue products pass to the flue connection inside the corrugated drum. This drum is baffled to give a long gas travel and very complete heat transfer. The cool incoming air divides, part pass-

ing within, the rest outside the drum. The warmed air passes out through the open top.

All warm air heaters must be flue connected with a draft hood in the flue line.

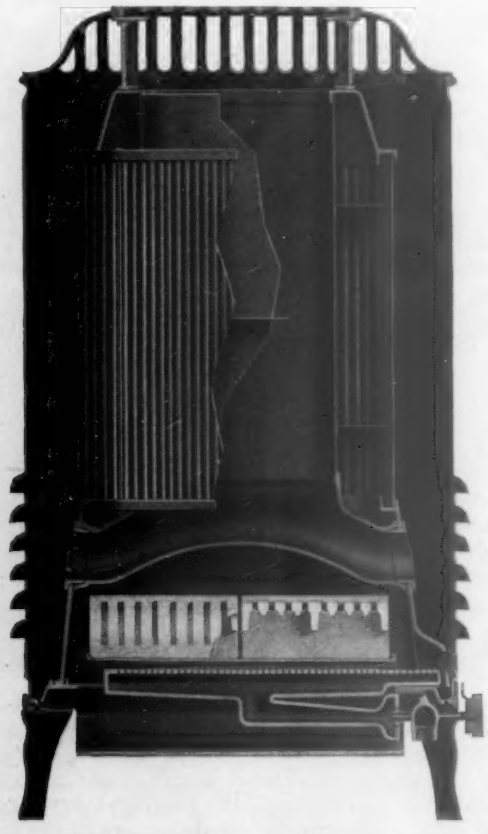


Fig. 9—Sectional View, Cabinet Heater showing Radiants, Corrugated Drum, etc.

The gas supply is controlled by a thermostatic pilot in many designs, by the conventional room temperature regulators and by a heat regulator installed just ahead of the main gas control.

The usual capacities of cabinet heaters are

Small —20,000—25,000 B.T.U. input
Standard—35,000—45,000 " "
Large — 60,000 " "

The standard heater has sufficient capacity to heat a 4 room railroad flat or a bungalow of the same size. The large size will heat a 6 room railroad flat or a small 6 room house.

The application of this type heater for small stores is desirable and worth while. For such service the neat vitreous enamel jackets, the tempered heat and cheerful glow give very satisfactory results without taking away an appreciable amount of floor space.

The following table gives the sizes recommended for heating stores under the usual conditions of daily trade.

RECOMMENDED CABINET HEATERS FOR STORES

Type	Exposure	Dimensions Deep	Wide	High	No. of Heaters Small	Standard	Large
1 story corner Tax payer	Front, 1 side and roof	40′	20′	10′		2	
		60′	20′	10′	1	and	2
1 story inside Tax payer	Front, Rear and roof	40′	20′	10′	1 and 1		
		60′	25′	10′			2
1 story inside Tax payer	Front and roof	40′	20′	10′			1
		60′	25′	10′	2	and	1
2 story corner Tax payer	Front 1 side				Heating Store Only		
		40′	20′	10′			1
		60′	25′	10′	4 or 1 and 1		
2 story inside Tax payer	Front & rear	40′	20′	10′			
		60′	25′	10′		1 and 1	
2 story inside Tax payer	Front	40′	20′	10′		1	
		60′	25′	10′		3 or 2	
B.T.U. input					20,000 to 25,000	35,000 to 45,000	60,000

These heaters must be flue connected with suitable draft hood, but require no special or additional insulation to protect from fire hazard.

(The next article will deal with Gas Refrigeration)

Discipline and Safety

MODERN industry is organized on a tremendous scale and is geared to perform huge tasks. Mergers are everywhere making for economy of operation. These consolidations improve productive service only in so far as we in our executive capacity are able to maintain discipline in our armies of workers. A plant is like a military unit; it is no better than its leadership. If an executive is lax, the entire organization under him reflects that laxity. If an executive is exacting but just in his demands upon his subordinates, his organization is the very mirror of efficiency, willingness, and precision. Discipline is the *sine qua non* of efficiency in production, *and* safety consciousness is of the very essence of discipline.

To the executive who maintains discipline but has not yet learned to see the value of safety work, or who has failed to recognize his personal responsibility along safety lines, I make this statement: Try out for a reasonable length of time as extensive and intensive a safety campaign as your situation permits, and you will be amazed to find that the discipline in your plant—which up till now has had to be enforced from above—will be sustained among the men in an amazingly sympathetic and understanding manner. Subordinates in industry are exactly the same as subordinates in our army and navy; they are essentially good sports and only too eager to help sympathetic superiors in the exercise of their responsibility. You will find that men who now are doing things because they fear to lose their jobs will then begin to do the same things better, in appreciative response to your effort, as their superior, to make *them* safety conscious and *their plant* a safer environment in which to perform their work.— *John Stilwell, 19th Annual Safety Congress & Exposition.*

Merchandising Views and Reviews

AN ADVERTISING man of our acquaintance serving a group of gas properties, uses a weekly bulletin system to pass-on new ideas to those interested in various phases of merchandising. A recent bulletin contained a number of suggested captions for use in heading newspaper advertisements, letter subjects and subjects for window and store cards which we are passing on to you for what they may be worth.

Do not covet your neighbor's new gas range
It's easy for you to have one!

If father cooked he would have an automatic gas range.

A few pennies a day will save your pies and patients.

Save a whole week a year
Let the oven control do the pot watching.

Are you an oven peeper or does your Lorain watch your cooking?

There is no match for the new gas range
And there is no need for matches.

OCTOBER, for the gas man, who is out of the gloom and who has adjusted his mind to the fact that double exposure of merchandise to sales will swell his sales volume and greatly overcome the slump a great many salesmen have gotten into, will prove an ideal month to sell the full line of appliances on the display floor. Cool days and nights bring a desire in the new home for pumpkin pies and evenings around the cheerful glow of a gas-fire. Meanwhile, the need for hot water grows daily and the home manager is confronted with the problem of drying clothes, disposal of waste material and garbage, and quick healthful heat here and there.

Plan to advertise gas appliances that will solve these problems for her, install a display of radiant gas heaters in your store, display them in your windows, conduct cooking demonstrations, hook-up an incinerator and a laundry dryer and talk the convenience of gas appliances; use newspaper space and bill inserts and go ahead just like you were out of the glooms—There's many a man who has not lost his job or had his salary cut, who will buy some needed appliances if you will but show him that he needs them.

Work your little by little payment plan, for despite what has been said about the average man mortgaging his future and the big reckoning that "is to come," the extended payment plan has been thoroughly tested and not found wanting. It is a very good thing for a great many people and merchants and always will be, where used with discretion—and who is in a better position to judge the credit of his customers than the gas man.

Being a bear buys nothing; be bullish on the gas industry and you'll be surprised how sales will be stimulated. Remember the old mouse-trap maker had to come out of the brush and set up his shop on a hard road where he could expose his wares to sales.

A MAN who is jobbing a number of gas appliances, including a nationally advertised line of gas heating boilers and furnaces, was all het-up when we lunched with him a few days ago. It seems that the commercial manager of a combination company in his territory, after persistently refusing to go in for gas house heating on anything like a respectable style, suddenly took on a line of oil burners and was displaying and talking them in all properties under his supervision. "The bloomer," said the jobber, "gave as his reason, that he was getting a nice load from the motor used in connection with the burner."

Of *oil* things! Can you fancy that? After all that has been said about the need of building up the domestic load! We can find no excuse for any such brand of reasoning and can see no reason why any man who has gas burning equipment (appliances other than home heating furnaces) for sale should even think of selling oil burners. Even if he did not wish to stock and install gas home heating equipment, he might at least work-out a co-operative plan with some heating engineer whereby he would do the advertising and let the dealer do the rest.

FOR the man who wishes to humanize his window display of radiant gas heaters we offer an idea created by Robert M. Angell, Display Manager of the New York Power and Light Corporation, Albany. This display while used during the spring is equally appropriate for fall; simply substitute the word "fall" for "spring" and your story is told.

The color scheme used in this display was a yellow cut-out (circle) center piece

For spring winds and wet days
Spring days are often windy wet days – with a cold threat in them for the kiddies when they come from school with cold noses and wet clothes
A RADIANT GAS HEATER
Dispels chills and and dampness with its instant heat

with a back-ground composed of rays of red, orange and deep yellow. The lettering was in lavender, as was the figure. The radiant heater, as will be noted, was mounted on a base slightly higher than the floor, forming a story telling-selling display as you will agree.

Why Advertising in Nevada Helps the Dealer in New Hampshire

We Americans are the most restless people on earth. We just can't "stay put." We travel more miles per capita per year than any other nation on earth.

The value of a vacation is measured by the miles we travel. A honeymoon isn't a honeymoon unless it takes the happy couple from coast to coast. Our sons and daughters are not satisfied to attend a college within their own State boundaries.

Any man will pull up stakes and move his furniture and family a thousand miles for a better opportunity.

Yet wherever we go we want and expect to be able to buy the same things and the same services that were available in the old home town.

In the course of a single year the American public travels within the boundaries of its own great land 143,115,477,750 miles by motor car, 521,349,000 miles by railroad, 7,472,000 miles by airplane.

THE above from *Magic Chef*, gives a good slant on the effects and coverage of advertising, yet, this reviewer finds the following question bobbing up in his mind. Does "Just Married" tune in with "Nevada?"

"THEY Will Build Your Gas Load," and there can be no doubt about it. We are talking about gasteam radiators. Gas men who are interested in selling heating to all-comers should have the new Clow Gasteam Sales Helps, a portfolio that starts with a brand new catalog and goes through the list of constructive sales helps to inserts. Particularly interesting are the post cards offered. These cards may be mailed broadcast, we would say, to every heating prospect on a gas company list,—and advantageously. Southern gas companies will be particularly interested in these new helps, for as this writer remembers, there is a vast potential market for gasteam in the southern states where a great many homes and commercial buildings have no basements. Also, the flexibility of gasteam is worth a great deal in the southern climes. Gasteam will certainly help build your load and open up new markets for gas service.

TOLEDOIANS were recently told the story of the gas heated laundry dryer in a big way. The gas company in that Ohio city ran a series of very effective newspaper advertisements playing up the advantages of the gas laundry dryer in a manner that held an appeal for every woman who has anything to do with solving the big end of the clean clothes problem, drying. And best of all, the advertisements were written by a man who understands just what wash-day problems confront every home manager. For instance, note how he handled the problem of drying on rainy days in the advertisement shown on this page.

WASH
THE SAME DAY
EVERY WEEK
$500
CLOTHES DRIED, STERILIZED AND BLEACHED RIGHT WHERE THEY ARE WASHED
THE WEATHER CAN NEVER INTERFERE IF YOU HAVE A LAMNECK CLOTHES DRYER IN YOUR BASEMENT
LAMNECK CLOTHES DRYER
THE GAS COMPANY

HERE'S an advertisement from the versatile advertising department of the Laclede Gas Light Company, St. Louis which proves that a gas man may employ the ultra-modern trend to a nicety. This advertisement, with its a la John Held, Jr., style of illustration and typography, is said to have aroused a great deal of interest in the city on old man river and from the number of folks that have been seeking information in regard to carefree hot water service, it would seem that it has done its bit to make St. Louis folks hot water conscious, whateverthatis.

Just an
old fashioned custom
Waiting for the Saturday night bath
It would be just too bad if we had to rely on old fashioned methods of water heating to supply our present-day needs. The whirl of modern activities demands an ever present supply of hot water, stored, ready to gush forth at the turn of a faucet.
People who keep up with today's animated existence consider an abundant hot water supply indispensable. They have found, too, that this luxurious convenience is inexpensive. The new low-priced automatic storage gas water heater can be purchased on small monthly payments made with your gas bill and its operating cost is only a few cents a day. Get your water heater now. It will prove mighty convenient during the hot Summer months.
The LACLEDE
Gas Light Company
Olive at Eleventh
Central 3800
3524 N. Grand
3189 S. Grand
2744 Cherokee
(3 blocks south of Arsenal)

A WEEKLY cash prize of $5.00 to the salesman selling the greatest amount of merchandise is said by a western sales manager to greatly stimulate his appliance sales. This man states that this $5.00 award has caused his men to double their efforts and even do much "after dinner speaking."

"It is the competition idea not the monetary value of the award that works the wonder," he says.

THE thousands who stroll on Michigan Boulevard, Chicago, have been made hot water conscious these past few weeks by a very novel water heater display in one of the windows of The Peoples Gas Store. The display which we are reproducing on this page combines three essentials to a good window display; adequate and properly distributed light, color and motion. The color in this display

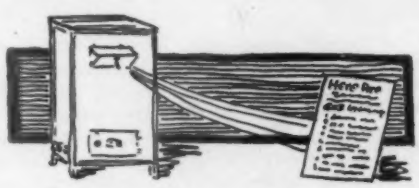
is in the columns and in the back-drop, the light in the whole window, and the motion in the figure of the gent in the bath tub. City folks like to stop and rubber and at times they call for a traffic cop; that's what happened at this window on several occasions, or anyhow it looked as though one would have to be called, yet the smile never came off the gent's face for he was enjoying inimitable hot water service.

A GROUP of southern gas companies are conducting a gas range sale in which a premium in the form of a small electric clock is being offered to all purchasers of oven heat controlled gas ranges. "The electric clock," said the sales manager of this company, "is so new that it has a great appeal to the home manager. We select a clock that may be used in any room in the home; kitchen, living room, bed room or where-not; and we have instructed our sales people to also suggest that this premium will prove mighty useful as a time-piece for the top of the radio. The idea, we understand, was originated by a middle west advertising man."

A GAS company in one of the northern states has revived the "diploma" for use in connection with a series of lectures conducted before Women's Clubs, Women's Civic Clubs, Women's Junior Leagues and customers and cooks. The diploma which is printed in gold is given to all who attend a complete series of lectures on Home Economics. These lectures are so arranged that the greatest amount of stress is laid on the simplicity of cooking with a modern gas range and the value of other automatic gas appliances to the woman in the home. At each lecture a number of recipes, menus and home hints are distributed to all in attendance and at the close of the course those who have not missed a single lesson are presented with the diploma and a binder for their recipes.

A PAMPHLET recently issued by the Chamber of Commerce of the United States summarizes the following elements as essential to both chain and independent retailer's success: "convenient location, suitable building, clean attractive display, effective use of publicity, efficient and courteous employees, specialization in goods and services, detailed accounting, and scientific buying."

WHAT the Joneses buy is said by a wide awake merchandise man, to greatly influence the sale of many home appliances. This man cashes-in on the idea by listing the names of users of certain appliances that he wishes to push over a certain set bogie. Recently, he made a drive on incinerators and, in order to put-over the idea that "the Joneses use it," he went over his list of purchasers and selected a group of names of prominent users.



Calling a show card writer he had a card worked out showing the "Joneses." He then built a hexagon pedestal ten inches high, covered it with bright red velour and mounted his incinerator upon it and placed it in his display window along with the list of users. The result was that without any further form of advertising, he made a number of sales and secured a number of live prospects. This same idea may be used to secure interest and make sales of any gas appliance. When you build such a display in your window be certain that you have a working display on the floor of your store.

WHY don't the gas man tell folks what a few cents worth of gas will do for them? The electric folks have and are playing that bet heavy. Why don't the gas man tell the home-manager that a few pennies will solve her garbage problem, iron her clothes, provide hot water for what-will-you etc?—So far, the only play-up on the penny that has been half-way played-up has been done by the *Electrolux* refrigerator advertisements. It seems that now, of all times, a play on the "few cents" idea would be effective.

REFRIGERATION by gas is a year-around business and in that gas men at large are ever on the look-out for new ideas for use in connection with the sale of gas refrigeration, we are passing on an idea that came to our attention the other day—a one week sale of gas refrigerators, wherein the gas man offered the purchaser a gas range free.

FREE
for One Week Only
This
VULCAN GAS RANGE
With the Purchase of a
NEW
ELECTROLUX GAS REFRIGERATOR
9 Distinct Advantages of the ELECTROLUX
A Small Payment Down—2 Years to Pay the Balance
The Time Is Limited—Don't Overlook This Opportunity
Kansas City Gas Co.
A Cities Service Company

GOOD ideas that are not put to work are round pegs in square holes," said a man who is always looking for new ideas to incorporate in his newspaper and window display advertising. "Put your ideas to producing," he said; "think of them as salesmen, and give them an opportunity to sell for you by putting them into your window displays and into your newspaper advertisements, inserts and booklets."

Making a Success of the Small Company

A narrative of how one organization popularized the use of gas; with especial reference to overcoming electric competition

A. A. WHITLOCK

General Manager, Piedmont Utilities Company

So much has been said about building and operating the small gas plant that I, a comparative newcomer in the industry, find it rather difficult to launch forth into a narrative that might be construed as criticism of some of the work that has been done by older and more experienced heads than myself. Still, successful results, I presume, give one the privilege of blowing one's horn, so to speak, even if some of the notes might seem a bit out of tune.

Early in 1929 we started the construction of our plant in Hickory, N. C. and in August of the same year gas was turned into the mains and services. The territory served finally came to include the towns of Hickory, Newton and Lenoir, with populations of eight thousand, five thousand and six thousand respectively. It cannot be emphasized too strongly that this territory was one of the very best electric using territories in North Carolina, with a rate of 4 cents and lower. Further, the company serving this community with electricity is perhaps one of the most energetic in the entire country. Hence, it can be seen that we faced competition of a very vigorous sort in an area already saturated with electric appliances.

At the very outset we adopted an optimistic attitude and clung to the belief that entirely too much concern is being paid to the matter of low electric rates and the attendant "squeal" about electric cooking and water heating versus gas cooking and water heating, whereas not enough attention is being devoted to the lower rate, big volume load for the small gas company. And when gas men generally, take this point into consideration more seriously and get ready to take their "licking" for a year or so while their load is being developed, the story will be of an entirely different nature. A digression along this line might well be in order.

Some gas men will tell you that it is too costly to put on a low rate load, and therefore they do not want it. But where is the gas man with a paying load on his plant who would not like to increase his output by one more million per month at a profit of ten to fifteen cents per thousand cu. ft? Such a man should not be in the industry; he is only a "nickle nurser" and a positive hindrance. We all want more output, but are we willing to pay the price for it? The price of this load is only an economical rate for the consumer, less profit in merchandising and jobbing and a good rate on house-heating and industrial gas. Not much of a price if we want the load, and after all, it is gas we are selling and not merchandise for our main income.

If we will squarely face this matter output will jump up, income will increase, the price to the consumer can be reduced and then where is electric competition? Common sense tells us that when we compare heat values and efficiencies, no electric power at the present rates can compete with gas fuel, at a rate that is equivalent in price to the consumer as that of electric power, for water heating, cooking, house heating, commercial and industrial heating, and last but not least, refrigeration. Some good, keen-sighted gas man may criticise this line of talk and say that it wont work, but I still say that it can be done.

We started our operation as mentioned before, not only in a strongly fortified and well saturated electric community, with electric appliances just any and everywhere, but we had the most difficult kind of prejudice to overcome. A great many people in the territory that we are serving had the most vague ideas of gas imaginable and a good bit of educating had to be done in order to get them to see things properly. During our campaign of education some one was circulating nonsensical stories about the danger and inconvenience of gas and we had the most bitter opposition to cope with from somewhere all the time. We knew, where some of the stories came from and traced them to their origin, but did not quibble about them as we did not want to stir up any unpleasantry that would do us more harm than good. Stories were going about that gas would be far more expensive at the rates we would be forced to employ than electricity or other fuel, that we would never finish the plant, that it was only a promotion scheme, that gas would never be turned in the main and if it were, it would be two years off, etc., etc.

Results of "Sawing Wood"

However, we just "sawed wood" and let the other fellow carry it. After one year's operation we were able to boast of, by the consumers' meters, better than two million cu. ft. of gas load per month on our lines, 670 meters, 419 gas ranges, 125 tank heaters, 119 auto storage and instantaneous water heating systems, 60 refrigerators, 70 space heaters, 1 house heating central boiler, 2 heatrolas, 105 miscellaneous appliances, 21 steam tables, 84 hot plates, and in all, 1009 total appliances, with an average consumption per meter of 3280 cu. ft. and an income per meter per month of $5.36. This is largely the result of a low rate on gas which we are contemplating lowering some more before the end of 1930.

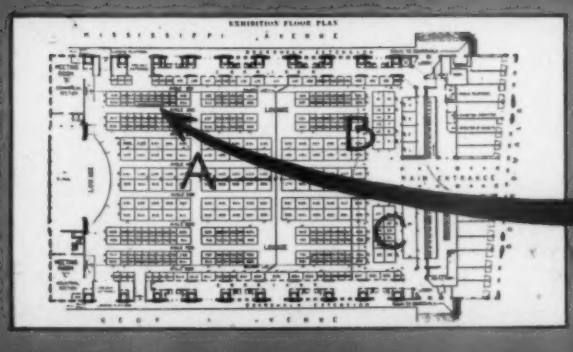
We also have in our warehouse at the present time, dozens of electric water heaters, ranges, oil ranges, water backs, oil heaters, etc., besides many that have been shipped away both in and out of the state but will never under any circumstances be sold back on the gas lines. This latter phase is attributed to two things; commonsense trading and allowances and a hustling organization. Of this organization incidentally, there is only one other than myself at present who has ever had any previous gas training.

While building the plant we had several solicitors working the proposed territory to be served, and in their rounds meeting the prospective consumers, they came in complaining of the conflicting stories going about and stated most emphatically that their prospects were not so good. It immediately became apparent that some-

(*Continued on page 95*)

JANITROL

Speeds To Atlantic City



320	319	318	317

Welcome!

with Merchandising

for Pushing up the Your House Heating

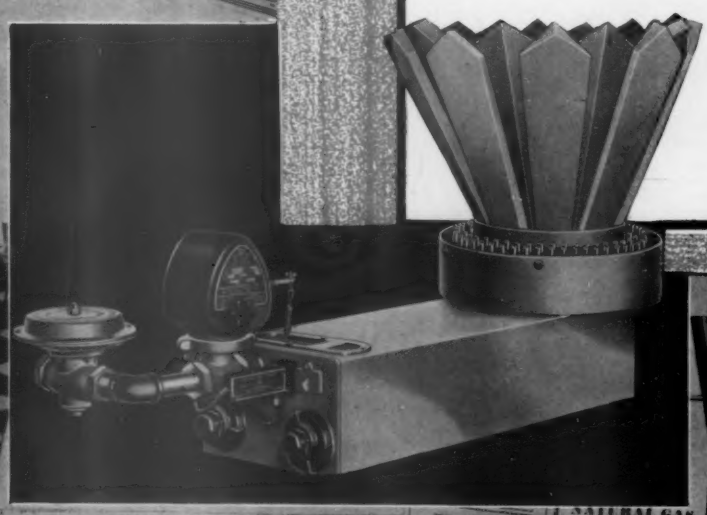
JANITROL Headquarters this year have much to tell you about House-Heating Equipment and Plans for Selling, Advertising and Merchandising . . .

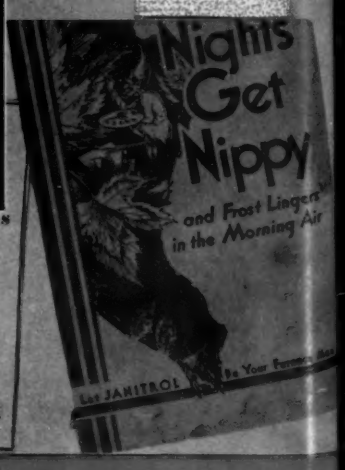
. . . there you may assimilate new thoughts . . . learn of newer developments . . . interchange ideas . . . and find "Ways and Means" to make your House-Heating activities build greater goodwill and more profitable loads.

Make JANITROL Headquarters your headquarters. Get acquainted with everyone of the JANITROL Assistants.

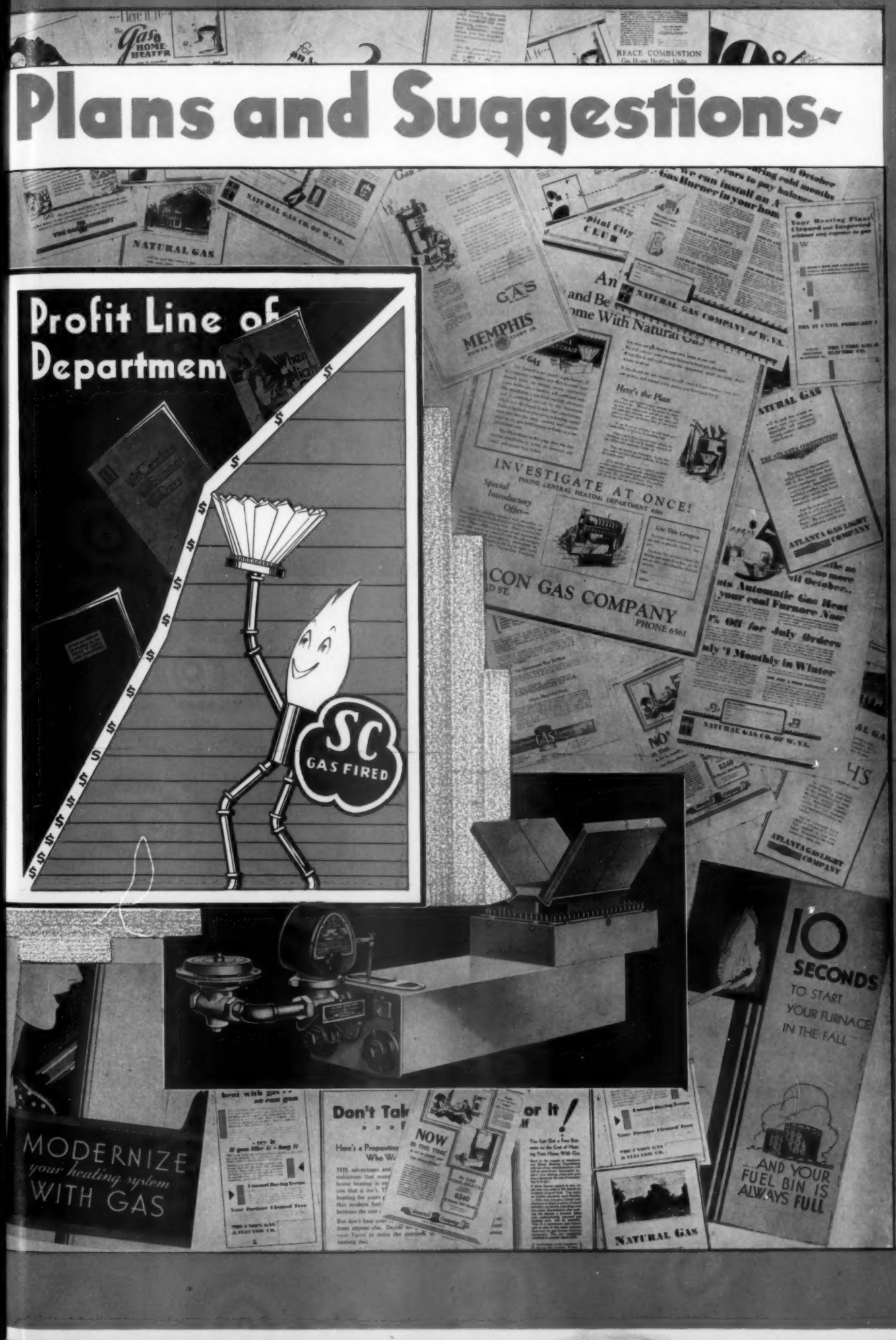
JANITROL Welcomes you to the 1930 Convention.

Ask for the "Ways and Means" Booklet





Plans and Suggestions-



JANITROL PROVIDES—

1. "Fire Your Furnace from Your Easy Chair" — that's Convenience.

2. Automatically controlled — no fluctuation in temperature — that's Comfort.

3. Eliminates handling of fuel, removal of ashes, the smoke nuisance — that's Cleanliness.

4. So constructed that little or no attention is required — that's Simplicity.

5. Easily installed in almost any furnace or boiler — that's Application.

6. Equipped with a dependable patented protective device — The Safety Pilot Light — that's Safety.

7. Regulated pressure, maximum heat utilization, correct application — that's Economy.

8. Small initial investment, reasonable installation charges, negligible maintenance, long life — that's Low Cost.

9. Gas is a modern fuel for house heating. Over 20,000 home owners use JANITROL — that's Acceptance.

10. Merchandised by more than 150 Gas Companies — that's Indorsement.

11. Listed as Standard by Underwriters Laboratories — that's Approval.

12. A trained Engineering Sales Organization behind every installation — that's Service.

13. Sales increase 125 per cent in one year — that's Progress.

14. Works as an invisible Janitor — that's JANITROL.

15. JANITROL — that's Increased Loads, Greater Goodwill and More Profit.

THE SURFACE COMBUSTION CO.

INCORPORATED

TOLEDO, OHIO

Making a Success of the Small Company

(*Continued from page 90*)

thing must be done to counteract these stories, and the procedure was as follows. A half page ad was inserted at intervals in the daily newspaper combatting all such stories and advising the public that we did not consider ourselves as competitors in the field in which we intended to serve, since there was nothing that could compete with gas for a fuel service where heat was needed, for speed, economy, convenience, etc. One of these ads is reproduced below.

"IF IT'S DONE WITH HEAT YOU CAN DO IT BETTER WITH GAS" SOME FACTS CONCERNING GAS SERVICE FOR THE BENEFIT OF FOLK NOT ACQUAINTED WITH GAS SERVICE AND WHO HAVE ASKED US MANY QUESTIONS BECAUSE OF HAVING BEEN MISINFORMED.

Gas does not create any odor in your home. Gas does not blacken or smut your cooking vessels.

Gas is the quickest possible modern method of cooking, water heating, refrigerating, house heating or anything for which heat is used.

There is no method of heating on earth known to scientists or engineering societies that affords the quick, efficient, low-price, economical heat that gas affords, regardless of whether it be in the home or out of the home.

Good gas service means a 365-day and night service, (uninterrupted) throughout the year.

The housewife can prepare her daily meals and serve them and forget about it with the use of a good gas range and good gas service while she is thinking about it with other ways of preparing them.

The greatest fact of all is that the lines of the Piedmont Utilities Company are being built into your city with all possible speed and bid fair to give good gas service by July, 1929.

Watch this space in Thursday's paper for astonishing information concerning the appliances to be installed in your homes. News concerning the prices, allowances, easy-payment plan, etc.

Use Gas and Bank the Difference.

PIEDMONT UTILITIES COMPANY INC.

HICKORY, N. C.

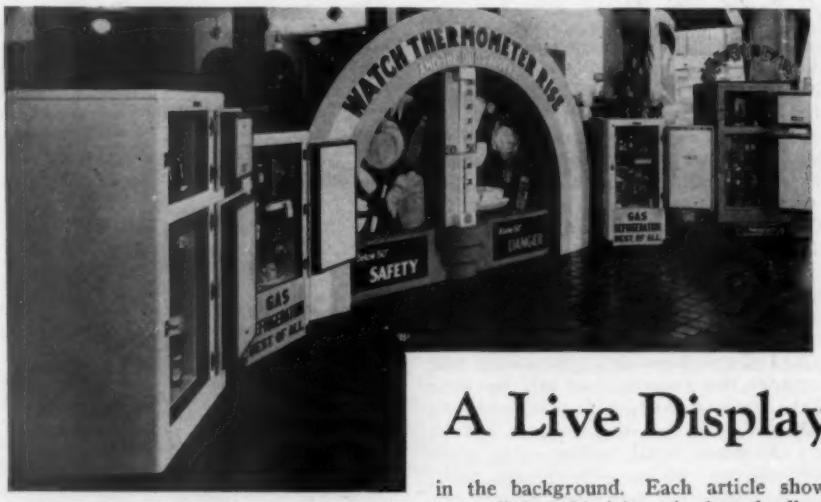
Such publicity certainly did have its effect. We next had a meeting of every solicitor, office worker, mechanic, helper and laborer for the purpose of invoking extra aid in killing such propaganda. At this meeting we drilled, grilled, talked, etc., gas and nothing but gas and advised them to argue with no one concerning the stories. We got them saying; "If it's done with heat you can do it better with Gas." Every man was also instructed to refer to the electric company as a good company and as our friends, and that absolutely no knocking would be tolerated.

Late in August, 1929, at 7:30 P.M., we had our formal opening after about two weeks operation, during which time we had placed many meters and appliances in use, scattered over our territory as wide as possible in order to have some real working advertising for our prospective customers. Printed invitations had been sent out to as large a mailing list as we could scrape together and a demonstrator was on the floor demonstrating the baking qualities of one of our gas ranges, with lots of baked goods on display that had been baked the day before and during the same day. The office was attractively decorated, thousands of souvenirs were provided to be handed out to ladies and children with refreshments and as well as a generous supply of cigars for the men. An orchestra furnished music and our officers were on hand to act as a reception committee. By eight o'clock one could not get into the office for the crowd. A real amount of interest was shown and thousands of questions were asked. We picked up prospects by the score, Folks were at the opening that we had no idea would be interested at all.

Along about this time we began to hold regular meeting of the employees. However, there was not much use in setting any particular time for such meetings as we always found about every one of them in the office each night except the trench workers and laborers. Our salesmen, service men, office workers, gas makers, in fact, about all of them would return to the office each evening after changing to street clothes and having their supper. So real was their interest in our putting this thing over that they did not feel that their work was complete until they had come to the office to see what the accomplishment had been during the day in meters set, electrical equipment pulled, etc. Every one had his say as to how to get more business. We showed an interest in the employees, let them know that they meant much to the organization and that we wanted them to furnish anything possible in the way of an idea. Incidentally, one can force an organization to do most anything but when the employees all know they are helping to run the matter and are led and not driven is what counts. Time meant little to us as we worked from seven in the morning to night and way into the night.

At these meetings it was made plain to everybody that we had built a gas plant for the purpose of making and selling gas and that anything, anywhere, that would burn and use gas and make a meter run was what we were most necessarily after, and not so much a merchandising plan. They were told that we did not wish to run into the red in the merchandise statement but that the latter was better than to run low on gas load. In making this fact plain to them it was also pointed out that we had one of the finest rates to get the load to be found anywhere and that we were going to allow good trades so far as the customer was concerned and thereby make sales easier to secure.

(*Continued in an early issue*)



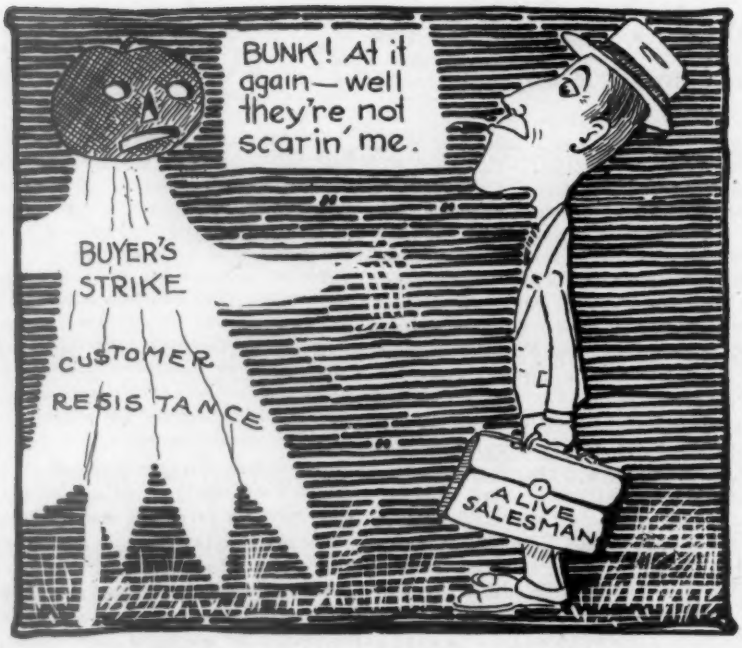
A Live Display

THE Portland Gas & Coke Company, in their main Displayroom in Portland, Oregon, installed an enormous thermometer as shown in the accompanying photograph, which is so arranged that, as the red liquid moves up and goes above 50 degrees, bugs representing danger germs, appear in the fruits, vegetables, etc. shown in the background. Each article shown has a light behind it and when the liquid rises above 50, these lights are automatically turned on and stay on while the thermometer rises until its descent below 50 again. The moment the liquid drops below 50, the lights go off and the bugs are no longer visible.

As moving displays always attract people's attention, this large thermometer has been the source of much interest from passers-by.

The Good Ones Don't Scare

HYLAN PIPER



SO FAR Nineteen Thirty has been a stupendous year for tree-sitters, a prosperous year for pee-wee golf and a depressing year for those who theorized on conditions and followed the crowd.

Good men and true, listening to gossip, looked for more gossip and, growing panicky, have been ghosts. Such a year! And yet, despite all the dark clouds, in many places sales records have been shattered.

The sudden decline of an inflated market last fall was disastrous to a large number of our citizenry. Paper profits melted and despite the assurance of nationally known business annalists that the slump was only a seasonal one, a high-pressured public began to see things. People generally, talked tariff, prohibition, politics, production, probabilities and poormouth.

Throwing Cold Water

John Public awoke one crisp, cool, pre-holiday morning feeling like a million dollars. Things were okeh with him. At breakfast Mrs. John remarked: "How are you feeling this morning, John, dear?" As he backed his new six out of the family garage, friend neighbor shouted: "'Smatter old man, tired this morning?" Then the right-hand man at the office greeted him with: "John, old top, you don't look like you feel good today" and to top it off, at lunch a friend remarked: "Old man you look like you are worn-out and need a rest and quiet." The next morning found John Public abed nursing a hot water bottle, for John had been talked sick. That is just what happened to a lot of other wise, hard-headed business men during the past few months. They have been talked, or have talked themselves sick. Someone told someone that someone had told someone that someone had said that someone had told him that there would not be any business until spring and when spring came and business did not walk-in, someone had said that it was because there had been no rain but that there would be an up-turn in the fall and in the meantime, a great many business men went mentally tree-sitting.

Just sitting and talking conditions got to be a national sport for a great many merchandising men. Sales plans were filed in the waste paper basket, sales forces were pared, advertising was given a vacation and the boss, hearing all the shooting, took himself to the country club, remembering the bed-time story, "Misery loves company."

On the other hand, home managers hungered for modern appliances as never before—and many of them were able to realize their desire for possession, for another group of men who heard the shooting had taken an extra hitch in their belts and gone out after b'ar. These are the men who have broken and set up new world records for the sale of home appliances. They did it in the obvious way; laid out a plan, built-up a close knit, hard working sales organization, laid-down a barrage of advertising and sent their men over the top. They did not talk conditions; they talked modern gas ranges, cool kitchens, food preservation, cleanliness, easy to own, more time for bridge, or what will you. These men understood that there was a need and they set out to supply it. 'Tis the old story, "Selling will sell."

Opportunity Makers

Men who ignored conditions and dug-in with a determination to win have accomplished much during the past nine months. A man who could not keep a salesman for the reason that they complained, "there is no business to be had in this town," started out to do a little selling himself and sold more merchandise during the first eight months of the year than a crew sold during the same period last year. A new man replaced an old-timer, who resigned "because folks are not spending," set-up a gain of around $10,000 for the first quarter of old 1930. A new recruit went into a territory where a high-powered salesman had said "the people are too tight to buy ranges" and sold in the neighborhood of ninety bottled gas outfits in less than thirty days. A chain drygood store operating nine units in small mining communities, sold approximately one hundred gross of rubber aprons simply by having all sales girls wear one. A dealer cleared out a stock of table appliances that had warmed his shelves for four years, by putting on a one cent sale that worked out in such a manner that he took only a ten per cent reduction from the regular price. A large power company selling electric ranges for the first time in a big-way built-up an electric range business that is worrying its gas company neighbor and enlisting the support of the cities leading department stores and specialty dealers. It's the old story; "where there is a will there is a way" to build business.

A State of Mind

Right now we are willing to agree to anything that *business has been*, yet we feel that a great many sales curves that have taken a new low during the past few months have done so for the simple reason that someone has been talked sick. When you actually get down to cases and percentages you will find that the larger percentage, of our population is at work and have been all the time. They are affected with a state of mind that is looking for something to happen and are saving and creating family wants that one of these days someone will satisfy.

As we view it, the manufacturer's job, the executive's job and the merchant's job is first, to get right with himself; then, by tightening-up (not laying off) his sales organization, by putting more time, thought and push into his sales plans, by giving advertising a freer hand and intensively cultivating and fertilizing his field he will find that there is business to be had. Clear the decks for action right now and profit by past experiences.

This is the most auspicious time for the gas industry to get into action. With key men of the industry hobnobbing at

the greatest convention in the history of the industry plans may easily be laid that would culminate in the greatest sales boom that the industry has ever known. In starting a movement of this kind it should be thought of as a *co-ordinated movement* on the part of the industry, to point out to its countless customers who have in no manner been affected by lay-offs or wage cuts, what the industry has to trade for the dollars they are hoarding.

Swap experiences with your fellow gas men, visit the exhibits, examine the appliances on display, ask questions, secure literature and prices, attend the business sessions of the convention, make notes of things you see and hear, and don't tell anyone, or even for a moment think that things are not on the up-and-up. Have a good time, acquire a bunch of new ideas, a fresh view point and a will to do, at the 1930 convention. When you return home, be ready and resolved to reap the golden harvest that's in your own back yard. Fill the empty fire places with radiant gas heaters, beautify the kitchens with modern gas ranges, cut down fire hazards by selling incineration, bring happiness to the home manager through the sale of gas fired laundry dryers, protect the family s food with silent gas refrigeration, and sell gas for househeating, and teach the family to enjoy the advantages of a continuous flow gas water heater. *Plan your work and work your plan*, and remember nothing hurts good little boys when they are busy, and that the good ones don't scare.

Versatile Salesmen

J. H. REED

SPECIAL training of salesmen, with the allotment of territory to each salesman following this training, is a plan which is proving successful for the Southern Cities Public Service Company.

In the past it has been the custom for gas companies to employ special salesmen for its different appliances. For example, one salesman handled gas ranges; another gas stoves; a third water heaters. It has been generally considered impossible for the ordinary salesman to succeed with gas heating installations for the company. Yet, under the system worked out by this company, and in operation in Atlanta and other Southern cities, one salesman sells every item in the territory under his care, and he is as capable of selling and supervising the selection of a gas furnace for the home as he is of selling a gas heater or gas range for the kitchen.

Upsetting Old Customs

In other words, the Southern Public Service Corporation, during the past six months, has upset a lot of old and established customs in the gas field. Further, it has demonstrated that one salesman, properly trained, can handle all of the work in his territory, making a good living for himself and at the same time increasing sales for his company.

There are three principles involved in the system.

1. The company secures high-grade men.

2. It gives them a thorough training, so that they will be able to handle all classes of sales except those that are highly specialized.

3. And it puts compensation on such a basis that the men who work are assured of a good living and will remain interested in their work and the welfare of the company. No educational requirements are demanded by the company. However, the gas appliance salesman must be possessed of certain fundamentals if he is to be successful.

The object of the company's school is to teach these fundamentals. And they are taught thoroughly, too. No skeleton sales talks are allowed. Each prospective salesman is required to memorize the company's sales talk as an early part of his training. From this point the training goes steadily forward.

Seven lessons are given, all of them involving the reading of certain books and supplemented by actual practical work in the shops and in the field. At the conclusion of each lesson, an examination is given. It must be passed, too, if the salesman is to get his job. The course of instruction and training lasts for about a month, and produces two important results.

The salesman who is mentally incapable of grasping the details usually drops out at the second or third lesson. Likewise, the lazy one. It is, first, a process of elimination by which the unfit eliminate themselves. At the same time, those who remain are thoroughly trained in the sale and service of gas appliances. They are perfectly capable of handling not only sales for their territory, but service, complaints and adjustments. It might be added, that all prospective salesmen are paid a small salary while they are in school.

Salesmen who complete the course of training are assigned to territories. As a rule, each salesman is expected to look after an area of 1,000 meters. Each calls on the trade at least four times a year. And each sells all of the appliances offered by the company.

One result of this is that the people in his territory get acquainted with the salesman. He acquires their confidence. And this is no small factor in building sales or in putting over seasonal campaigns on water heaters, gas refrigerators, gas-fired furnaces and the like.

Over each group of eight or ten salesmen is placed a supervisor, who is responsible for sales and service in his territory. The supervisors are responsible to the merchandizing manager for the results desired from any item or campaign.

The salesmen are paid a salary and commission on the items they sell, and it is interesting to note that the combined salaries and commissions of these territorial salesmen range from $250 to $750 a month!

An interesting point is that the work is attracting more and more college graduates, even though no special education is required. It has not taken the college graduate long to discover that the gas appliance field offers an opportunity, with a short period of intensive training, to earn from $250 monthly on up. And, naturally, college men are not entirely *persona non grata* to the gas company.

Under such a system, personality counts for much, and it is to the advantage of the firm to have men who are well educated, neat in their personal appearance, and on the job. Every month finds more college men enrolled.

What of the highly specialized gas field—the bakery, the candy shop, and other industrial plants that may lie in the residential districts? Does the system work here, too? To a large extent. In such a case, the territorial salesman is allowed to work up the business. If he succeeds in getting the prospect interested, a member of the industrial gas division makes the final call with him, and puts the deal across.

And, of course, the salesman gets credit for his part in making the industrial appliance sale.

An Exploded Theory

Can such salesmen sell gas heating to the public? Absolutely yes. The corps of salesmen in Atlanta, for example, have been selling from twenty to thirty gas heating units a week, and the campaign has been growing steadily, exploding the theory that has long been held to the effect that the appliance salesman could not also sell heating.

How is it done?

The salesmen are trained to estimate the heating requirements of a home. Before they ever take over their territory they are well grounded on the theory and actual practice of home heating. It comes as easily to them as the business of selling a water heater. The result is that they are selling gas heating as a part of their regular day's work—and thinking nothing of it. They have never been told that it has never been done and can't ever be done. So they just go blithely out and do it, with the result that they are steadily increasing the sale of gas for their company.

The system has been tried with success for six months. And it presents many

points of interest—and of real merit—for the gas company. It eliminates the "dumb" salesman and the lazy one, leaving a corps of picked men to work with.

It gives these men the training that is necessary to make intelligent salesmen out of them.

It saves the time and trouble involved of having to send for this, that and the other "sales specialist"—in the sending whereof many a possible sale is lost.

It places the responsibility of selling and servicing the appliances squarely where it belongs—on the salesman in charge of a definite territory.

And—last but by no means least—it offers the salesman an opportunity to make real money.

It is this fact, probably, more than any other, that is attracting the right sort of men to the field and building up the right sort of public confidence in the business—as well as sales.

Higher Court Reduces Land Valuation Fixed by Jury

Other Important Higher Court Decisions Involving Gas

LEO T. PARKER

IT is well known that a gas company may condemn private property for its use and the company is not compelled to pay the owner more than its reasonable value.

Generally speaking, where controversy develops between a gas company and a property owner, regarding the value of the land, a jury may determine its true value. However, the higher Court may reduce the value fixed by the jury, if it is excessive. So held the higher Court in the recent case of Warfield Natural Gas Co. *v.* Laferty, 22 S. W. (2d) 611.

The facts of this case are that a gas company condemned by legal procedure certain lands owned by private individuals for the purpose of installing a pipe line. The commissioners appointed by the Court to appraise the property rendered its decision and the gas company appealed to the Court on the grounds that the commissioners' appraisement was excessive. The jury upheld the commissioners' valuation, and the gas company appealed to the higher Court which carefully reviewed the testimony and reduced the valuation approved by the jury, saying:

"While the question of damages in a condemnation proceeding is for the jury, and its verdict will not be set aside as excessive when supported by substantial evidence, we are committed to the rule that opinions as to values without facts to support them, or based on facts that are more or less speculative or remote, as well as somewhat fanciful, are of little value and may be in a large measure ignored."

Gas Company Obligated to Bear Public Improvement Expense

Various Courts have held that although a gas company is authorized to lay its pipes in the public streets, the company takes the risk of their location and is bound to make such changes as the public convenience and security require, at its own cost and charge.

For instance, in the late case of Transit Commission *v.* Long Island R. Co., 171 N. E. 565, it was shown that a municipality decided to eliminate a railway crossing. Previously a gas company had been granted a franchise to lay its pipes in the street.

The gas company, realizing that it alone could remove or disconnect its gas main with safety, refused to obey the order of the Transit Commission, or to relocate its pipes, and refused to permit the contractor for the Long Island Railroad Company to interfere with its main, unless and until the cost of making the changes was either paid or guaranteed to it. Suit was filed to settle the question whether the cost of removing this gas main must be borne by the gas company, the owner of the same, or whether it is part of the elimination cost to be borne by the taxpayers and the railroad company.

In holding the gas company bound to make the repairs at its own expense, the Court said:

"The gas company has received from the public authorities its franchise or privilege to lay and maintain its gas main under the surface of the public street. Without this grant from the people it has no rights in the highway. This privilege, or franchise, is at all times subject to the police power of the State; in other words, the company maintains its pipes subject to the obligation to remove them whenever the public health or safety require this to be done."

Duty of Gas Company to Maintain Pipes, Meters, Etc.

A gas company must use due and reasonable care in the inspection of its pipes, to insure reasonable promptness in the discovery of leaks that may occur from defects in or deterioration of pipes and valves, from careless or wrongful meddling with its works on the part of others, or from any other cause within the anticipation of men of ordinary skill in the business. But it is not required that the company shall keep up a *constant* inspection all along its lines, without reference to the existence or non-existence of probable cause for the occurrence of leaks or escape of gas. If leaks or defects in the company's pipes occur because of fauty construction or otherwise through the company's fault, it is liable without notice for any resulting injury to person or property. The latest case involving this subject is Cramm *v.* Hutchinson Gas Co., 288 Pac. 599.

The facts are that an explosion occurred seriously injuring the occupants of a house. Suit was filed against the gas company on the grounds that the gas meter which had been installed by the gas company was out of repair and improperly constructed, or was so improperly and negligently connected with the pipes in the building that it leaked gas. The evidence indicated that this contention was correct. Therefore, although the lower Court held the gas company not liable, the higher Court reversed the verdict, and said:

"As the meter and its connections were furnished, installed, and maintained by the defendant (gas company), and the plaintiff (property owner) had no right to molest or interfere with it, we are of the opinion that the duties of proper installation, maintenance, and inspection of it and the selection of safe and suitable fittings for connection thereof with the service pipes, rested upon the defendant. Under the contract, it was the property of the defendant, and molestation thereof by the consumer was forbidden."

Injured Pedestrian Not Entitled To Damages

Generally speaking, a person, who sues a gas company for damages resulting from an injury, is bound to prove not only that the company's employees produced the thing which caused the injury but, also, that the injury directly resulted from negligence of the company's employees.

For example, in Community Natural Gas Co. *v.* Henley, 24 S. W. (2d) 10, a woman pedestrian sued a gas company for damages as a result of injuries sustained when she slipped and fell from a concrete slab that turned sidewise when she stepped upon it. She contended that the slab had been placed by gas company employees across a ditch excavated for the purpose of laying gas pipes. The jury concluded that the passageway was provided by the gas compay's employees for use in crossing over the ditch, and that, being justified in making such finding, it had a right to further conclude that the gas company's employees placed the slab across the ditch because the way would be incomplete without some such means for crossing over the ditch.

However, since she failed to *prove* that the gas company's employees actually intended to provide a passageway, the higher Court reversed the lower Court's decision, saying:

"That the dirt was piled in the way it was for the purpose of creating a passageway is purely a presumption. Based upon this presumed fact, the further presumption is built that, if a passageway was left between the piles of dirt, then the gas company must have placed the slab of concrete across the ditch in order to make the passageway complete. It is not permissible to presume a fact and than build a presumption upon the fact thus presumed . . . The fact relied upon

to support the presumption must be proved."

Utility Company Liable to Property Owner

In Bowen & Son *v.* Iowa Public Service Co., 35 F. (2d) 616, it was held that a property owner may recover damages from a utility company where a building is destroyed by fire as a result of firemen being unable to spray water on the building because of negligence on the part of the utility company's employees to perform any act necessary to co-operate with the firemen. It was disclosed that employees of the Citizens' Gas and Electric Company failed to turn off the supply resulting in the fire department being unable to quickly extinguish a fire.

The property owner sued the utility company for damages in an amount equal to the damage to the building. The lower Court held the company not liable, but the higher Court reversed this verdict.

Owner Entitled to Royalty On Gasoline Produced from Wet Gas

In Stine *v.* Lone Star Gar Co., 23 S. W. (2d) 752, the owner of property and an oil and gas producer entered into a contract containing a clause, as follows:

"If any well drilled on said land by either party shall at completion be, or thereafter become, productive of both oil and gas that may be saved and utilized in paying quantities, each party shall be entitled to the product owned by the party and to have the same saved."

The gas from the wells was conveyed from them to a compressor for the purpose of increasing the pressure of the gas so that it could be transported through the pipe lines. From this station the gas was run into a pipe line and conveyed to a city where it was sold for fuel purposes. During the winter months gasoline accumulated in the drips along the pipe line and this gasoline was taken from the drips in large quantities by many persons and used for running their automobiles without any refining process.

Later the producer used a process to convert the gas into gasoline and in view of the above clause the Court held the property owner entitled to a royalty on the gasoline, saying:

"The case presented the question of whether a lessor under the mineral lease in common use in this State may recover from the lessee for gasoline manufactured from casinghead gas under the stipulation for the usual royalty on oil produced and saved. It was held in an exhaustive opinion that the lessor was so entitled to recover."

Gas Company Liable for Injuries Sustained by Employee Going to and From Work

Considerable controversy has existed on the subject of whether a gas company is liable for injuries sustained by employees while traveling to and from work. Generally speaking, the gas company is not liable if the place of work is situated conveniently to means of transportation, such as a railway, traction line, bus line, or the like. However, if the employee is compelled to go to and from his work in his private automobile, the situation is different. It is settled law, under the latter circumstances, that all dangers and perils incident to the use of the usual and customary method of entrance to and retirement from the employer's premises are perils incident to and arising out of the employment. Moreover, usually the "course of employment" is not limited to the exact moment when the employee reported for duty nor to the moment when his labors for the day are completed.

For illustration, in the recent case of Federal Co. *v.* Ragle, 25 S. W. 2d) 898, it was disclosed that a gas company employee, who had just quit work for the day at a plant situated in an obscure location, was injured when attempting to crank his own automobile which he used to transport himself to and from his work. In holding the injured employee entitled to recover damages, the Court said:

"In the case before us, the injury was sustained on the premises of his employer and in the immediate vicinity of appellee's (employee's) work. While the employer had not assumed the obligation of transporting appellee and his co-laborers to and from work, yet it knew of the arrangement followed, and plainly recognized the necessity of the method of transportation."

Also, in another leading case, Casualty *v.* Green, 11 S. W. (2) 388, a man named Green was working for the Humble Pipe Line Company which maintained a camp where its employees were required to assemble each morning. They were then carried by the company's truck to the place or places where the labor during the day was to be performed. At the close of the day's labor they were returned to the camp on the truck and, after unloading the tools and placing them in the toolhouse, the day's work was over.

One evening Green broke his arm while cranking his automobile in which he traveled to and from his home and the camp. In holding the employee entitled to recover compensation, the Court explained that it is not necessary that the employee should have been at the time discharging some specific duty required by his employment, but it was sufficient that he was at the time of his injury engaged in doing something incidental to his employment.

When Mixture of Goods Entitles Suing Party to All Merchandise

Where one fraudulently, wilfully or wrongfully intermingles his goods with those of another so that there is no evidence to distinguish the goods of the one from those of the other, the wrongdoer forfeits all his interest in the mixture of the other party. In other words, he cannot recover for his own proportion or for any part of the intermixture but the entire property belongs legally to the party whose legal rights have been invaded. This is true irrespective of the nature of the goods.

For instance, in Hall *v.* Shaffer, 289 Pac. 442, it was disclosed that a man named Hall, who owned a farm of 280 acres, leased 240 acres for the development and production of oil and gas. The lease provided that the gas company should lend their facilities for marketing the production of the gas, also to the marketing of gas produced from a gas well of Hall's then on the lands without cost for the service rendered. Later a lease for the remaining 40 acres of the farm was made to the same gas company which provided that in case of abandonment of the lease on the 40 acre tract or of the lease on the balance of the land, the gas company would give free of charge to Hall any well he shall select. The gas company abandoned the lease on the 40 acre tract and Hall demanded well No. 5. The gas company refused to give this well to Hall who filed suit. In the meantime the gas company had sold gas from No. 5 well and other wells. The gas, most of which was obtained from No. 5, was measured through a single meter. Therefore, since it was impossible to determine how much gas had been sold from well No. 5, the one belonging to Hall, the higher Court held Hall entitled to recover the value of all of the gas sold from all of the wells, saying:

"The gas company did not provide facilities for segregating that derived from the minor wells, a small quantity of which still passed through the meter. It was the duty of the defendant to furnish facilities for measuring gas to be delivered from the wells."

When Gas Company is Liable for Property Damage Caused by Fire

While, under certain circumstances, a gas company may be held liable for damages to adjacent property caused by fire, yet it is generally conceded by the Courts that convincing evidence must be introduced by the complaining party that the gas company's employes or plant actually started the fire.

For instance, in a recent case a property owner sued a gas company contending that the latter's employe, who entered the basement to read a meter, was smoking a cigarette and set fire to the house. However, since no evidence was introduced proving conclusively that the gas company's employe actually set fire to the building the Court held the company not liable.

Also, in another case Minnehoma Gas Co. *v.* Johnson, 282 Pac. 303, decided during the past few weeks, a property owner sued a gas company contending that his property adjoining the gas company's plant was set fire and destroyed by sparks originating from the plant's smoke stack.

However, since the property owner failed to introduce witnesses who actually observed the sparks coming from the gas company's plant and which started the fire, the Court held the gas company not liable and explained the law on this subject, as follows:

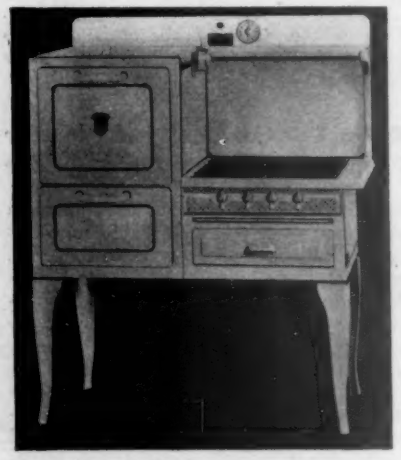
"The act of setting the fire may, like any other question of fact, be proved by circumstantial evidence. As to what extent the proof must go where circumstantial evidence is relied upon, the authorities are not in harmony. . . . The fact of the origin of the fire, like any other material fact, should be established; and while the jury, within certain limits, may be left to infer the fact from the circumstances proved, such proof should be sufficient to rebut the probability of the fire

having originated in any other manner. . . . It is common knowledge that destructive fires often occur in remote regions, the origin of which is impossible to trace. Many reasons for the origin of the fire in question might be conjectured; but, as has been stated, in cases of this nature it is incumbent upon the plaintiff (property owner) to trace the origin of the fire to defendant in order to recover. The question should not be left to conjecture and speculation."

EQUIPMENT NEWS

New A-B Stove Company Gas Range

The A-B Stove Company, Battle Creek, Michigan, presents to the gas industry what is described as "Time Control"—a fully automatic gas range that imposed no penalty on manual operation. This new product has a number of noteworthy features.



A-B "Time-Control" Gas Range

The Automatic control uses but a single pilot—on the cooking top, and there is no heat in the oven until the clock turns on the gas. The new range is equipped with a safety pilot valve which shuts off all the gas in case the pilot flame should go out. Yet, the automatic control places no handicap in the housewife's way should she desire to operate the gas range manually. It is simply necessary to turn the clock valve; and the range works exactly as thought the automatic control were not attached.

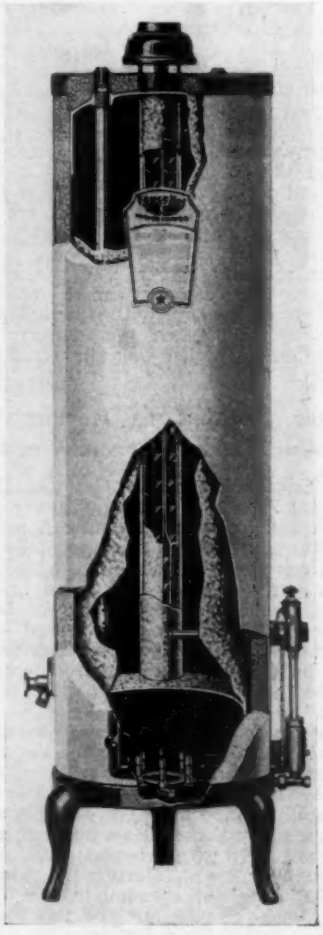
The time control range offers the housewife the last word in cooking convenience. For instance she may prepare her evening meal as early in the morning as she wishes. She places it in the oven at say ten o'clock (or earlier if desired), sets the time control to turn the gas on at three o'clock and off at six o'clock. She returns in the evening to a meal as perfectly cooked as though she had been on the job all afternoon. This new product is furnished in three full porcelain finishes with the A-B Super-insulated oven, the Dual Burner cooking top, the Sani-Tray and the removable cleanout tray.

Improved Vulcan Deep Fat Fryer

The Standard Gas Equipment Corp., New York City, describe a new improved model of the Vulcan Deep Fat Fryer in a leaflet recently issued. The new features include adjustable heat control to give just the right heat for the fat used, kettle easily cleaned because sides and bottom are unobstructed. Bottom is sloped so all the fat will drain out, new "cool type" sediment collecting well. Keeps fat cleaner, solid baffle strainer directs crumbs into cool sediment well, faster method of circulation used assures more even temperature of fat.

New "Fauce Hot" Water Heater

The Gas & Electric Heater Co., Utilities Division of the Bastian-Morley Co., La Porte, Ind., recently issued a booklet describing the "Fauce Hot" Water Heater. Illustration shows interior arrangement of heater. The tank consists of two compartments, the upper containing the stored water and the lower encasing the burner and pilot. It is equipped with a safety gas control which shuts off all gas to the burner if pilot light is extinguished. They are built in sizes from 15 gallon to 95 gallon capacities. Copy of booklet will be mailed on request.



"Fauce Hot" Water Heater

New Welding Regulator

The Oxweld Acetylene Co., New York City, announce the Oxweld type R-43 Oxygen Welding Regulator. They state that "A constant line pressure free from any fluctuation is most desirable for good results in oxwelding. The new regulator guarantees a freedom from fluctuation by means of a system of two-stage pressure

(*Equipment News Continued on Page 102*)

GLOVER-WEST VERTICAL RETORTS

Other Glover-West Installations

Fitchburg, Mass.
Springfield, Mass.
Portland, Maine
Ottawa, Ont.
Vancouver, B. C.
Victoria, B. C.
Watertown, N. Y.
Malden, Mass.
Fargo, N. D.
Toronto, Ont.
Guelph, Ont.
Santos, S. America
Pernambuco, S. Amer.
Buenos Aires, S. Amer.
Fall River, Mass.
Faribault, Minn.
Halifax, N. S.
Belleville, Ont.
Rio de Janeiro, S. America

PAWTUCKET GAS COMPANY—PAWTUCKET, R. I. Engineers—STONE & WEBSTER ENGR. CORP.

Three Glover-West Installations at this plant - - - - the third started producing gas in August

The first installation of Glover-West Vertical Retorts at Pawtucket was made in 1913, the second in 1927, and the third in 1930. When a gas company orders three consecutive installations—that conclusively indicates complete satisfaction with the low production and maintenance costs and the flexibility in operation of the system installed. It might be added that, due to the continuous improvement in design and construction of Glover-West Retorts the third extension was made without increasing the original plant area.

West Gas Improvement Company

Builders of Coal Gas Plants

441 Lexington Avenue New York, N. Y.

New Welding Regulator

(Continued from Page 100)

reduction. This two-stage reduction is accomplished through two separate and independent sets of diaphragms, valves and springs. The full cylinder pressure of 2,000 lb. enters the regulator through a stem-type valve and is controlled by the first stage diaphragm. In this stage the

Type R-43 Oxygen Welding Regulator

pressure is reduced to less than 250 lb. per sq. in.

"The oxygen then passes from this first reduction assembly to a second stem-type valve and diaphragm assembly where the pressure is reduced to the working pressure desired by the operator. This pressure is regulated by the operator by means of the adjusting screw, and any operating pressure may be obtained without fluctuation."

New Peerless Boiler Embodies Easy Clean-out Feature

The new Peerless househeating boiler recently brought out by The Peerless Heater Company, Boyertown, Penna., is equipped with easily removable clean-out doors. These doors which have handles are removed by means of loosening three clamps on either end, thereby giving access to the inside for cleaning and the like. Further details will be sent upon request to Peerless Heater Company.

New Oven Vent

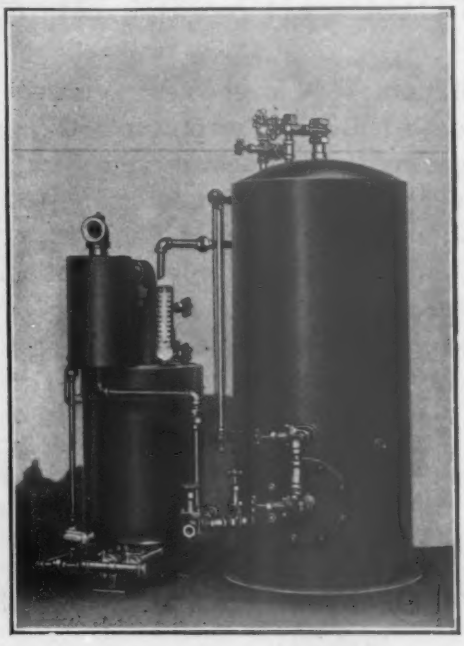
Monarch Products Company, Inc., 434-436 N. Front St., Baltimore, Md., have recently placed on the market the Ventflector, a gas range oven deflector designed to protect kitchen walls from greasy vapors of broiling and roasting

that emerge from open vents. The Ventflector is made in a number of enamel finishes as well as black japan. It is equipped with flexible aluminum stacks that slip over the range vent collar and is designed to fit all standard four inch vents on cabinet and cooker type ranges.

New Peerless Househeating Boiler

Gas Oil Foggers

The Western Gas Construction Company, Fort Wayne, Ind., recently issued a four page folder describing Western Gas Oil Foggers. There are three types of oil foggers, the mechanical, gas heated and electrically heated. Illustration shows the gas heated type. This type with the electrically heated are the two types of oil foggers which use the vaporization - condensation method of supplying fog to the gas lines. Each consists essentially of an oil storage tank, heating tank, centrifugal separator, necessary gauge glasses, oil level control valve, and a heating element which is thermostatically controlled. The energy input for fog formation is in the form of heat which is derived from either gas or electricity. The foggers will operate on a differential pressure of approximately 1 lb. per sq. in., but if this differential is not available, an integrally mounted electric - driven blower can be supplied.



These units are particularly adapted to use at booster rooms, holder stations and other points where large quantities of oil fog are required.

Descriptive folder will be mailed on request.

Rechrome Diaphragm Leather

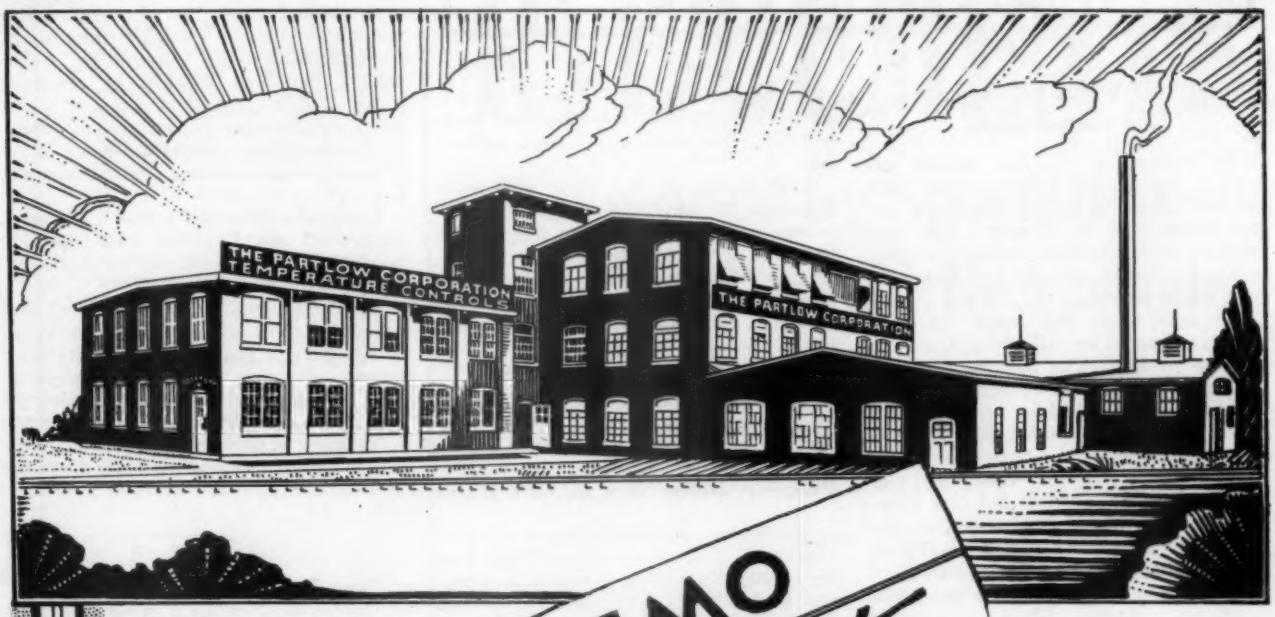
Besse, Osborne & Odell, Inc., 51 South St., Boston, Mass., tanners of "Colonial Brand" Rechrome Meter Leather, state that "Many of the largest Gas Companies who are now using their Rechrome Meter Leather are very optimistic over the results obtained from using this leather in their diaphragms.

It is now a matter of record that during the last two years not a single diaphragm has been found that was not in its original condition after the meter was taken down. Many thousands of meters are now out in service equipped with Colonial Brand Rechrome Meter Leather diaphragms. These meters are being serviced under all varying conditions, subject to extreme climatic changes and are standing up wonderfully well.

Colonial Brand Rechrome Meter Leather besides being made from superfine New Zealand lamb skins is put through three processes in the tanning operation resulting in a finished product that resists all moisture in the gas and enables the diaphragm to retain its mellow condition, thus giving accurate measurement.

This leather is also used in governors and regulators."

AMERICAN GAS ASSOCIATION CONVENTION
ATLANTIC CITY—OCTOBER 13th-17th



Our New Factory —the Third Expansion in Nine Years

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339

SEE A COMPLETE DISPLAY OF PARTLOW AUTOMATIC TEMPERATURE CONTROLS & GAS BURNING EQUIPMENT

If you are planning to attend the American Gas Association Convention at Atlantic City . . . October 13th to 17th . . . consider this an invitation to see the complete PARTLOW LINE of Temperature Controls . . . Universal Contactors . . . Safety Gas Valves & Pilots . . . also Gas Burning Equipment . . . in BOOTH 339.

Partlow products are universally recognized throughout the industrial field for their accuracy. This is true whether it is a Temperature Controller for maintaining the desired temperature, within the necessary limits, under adverse conditions . . . a Safety Gas Valve and Pilot for absolute complete shut-off of the heating medium . . . a Contactor or Gas Burning Equipment for specific use.

Remember . . . at BOOTH 339 . . . a cordial welcome and valuable information awaits you.

PARTLOW

THE PARTLOW CORPORATION

NEW HARTFORD, N. Y.

NEWS OF THE GAS INDUSTRY

Four New Wells for Allegheny Gas Corporation

The drilling of two new natural gas wells in the Mount Vernon, Ohio, field and two in the Buffalo Creek field, has been commenced by Allegheny Gas Corporation, with schedules calling for completion by Oct. 15, according to announcement made recently.

The new wells will bring the total number operated by Allegheny Gas Corporation to 163. The company controls gas rights in upwards of 38,244 acres in Ohio and West Virginia, with an estimated open flow of 40,000,000 cubic feet daily. Numbered among larger customers are United Fuel Gas Company and Huntington Development and Gas Company, subsidiaries of Columbia Gas and Electric Corporation; Owens-Illinois Glass Company, Libby-Owens-Ford Glass Company; Pittsburgh Plate Glass Company; Lamb Glass Company; Cooper-Bessemer Corporation, and South Penn Oil Company.

Plan to Build Gas Line From Alabama to Florida

Southern Natural Gas Corporation has developed plans to build a gas line from Mobile, Ala., to Pensacola, Fla. at a cost of about $1,000,000. It is proposed to have gas in the Florida port by Dec. 1. The extension will be approximately 67 miles long and give the Southern Natural Gas Corporation about 1800 miles of lines in the southeast.

The Pensacola line will be a difficult one to build because of the swampy region traversed.

Utica Gas & Electric To Extend Gas Mains

The Utica, N. Y., Gas and Electric Company has been granted permission to extend its gas mains for furnishing gas in the town of Herkimer, and for approval to exercise franchise granted by the town board. 139 have signed applications for service and it is expected that the number may be increased to 200 by the time the pipes are laid. It is proposed to lay immediately 8,633 feet of six inch pipe and 5,750 feet of two inch pipe.

Additions to Memphis Natural Gas Compressor Station Completed

Extensions to the Guthrie, La., compressor station of Memphis Natural Gas Company, to provide additional pumping capacity of 20 per cent. have been completed, according to announcement made recently. The work was started early in July.

Enlargement of the plant was made necessary to provide for a greater load of natural gas to take care of new heating contracts becoming effective this Winter. The Guthrie station, one of two stations maintained by Memphis Natural Gas Company, is located at the Monroe field end of the company's main 210-mile pipeline, which terminates in Memphis, Tenn. The other station is near Benoit, Miss.

Propose Reduction in Gas Rates

A voluntary reduction in gas rates in Vincennes, Ind., was proposed Sept. 4 by the Central States Gas Company in a petition filed with the Indiana public service commission. The reason assigned for the request was that a decreased rate would bring about an increased use of gas among the company's consumers. Existing rates also are discriminatory in favor of a small class of users, the petition said, and a readjustment for this class was asked. Proposed rates are $1.25 a month for the first 300 cubic feet; for the next 2,700 feet, $1.20 a month; for the next 2,200 feet, 60 cents and for each 2,500 cubic feet over that 40 cents a month, per thousand.

Texas Gas Utilities to Supply Texas Electric Service

An additional estimated load of approximately 182,500,000 cubic feet of natural gas annually will be added to the sales volume of Texas Gas Utilities Company, subsidiary of Appalachian Gas Corporation, as a result of the signing of a contract to supply the fuel requirements of the Eagle Pass, Texas, power plant of Texas Electric Service Company, bringing aggregate estimated power-plant fuel sales to this company and the Devil's River station of Central Power and Light Company to approximately 6,600,000 cubic feet daily.

The contract with Texas Electric Service Company becomes operative Oct. 16 according to Ross Holmes, chief engineer of Appalachian Gas Corporation, by which time the power company will have completed conversion of its equipment to burn natural gas instead of oil. Gas will be supplied from the recently-completed Rycade field-Mexican border pipeline of Texas Gas Utilities Company, which passes within less than a quarter-mile of the power plant, consequently no appropriation is necessary for additional pipeline.

Southern Cities Public Service Co. Acquires Interest in Georgia Natural Gas Corp.

Southern Natural Gas Corporation has announced that a one-half interest in Georgia Natural Gas Corporation, a subsidiary, has been acquired by Southern Cities Public Service Company which owns and operates gas utilities of Atlanta, Rome, Athens, Augusta, Macon, Waycross, Griffin, Valdosta and Brunswick, Ga.

The deal adds to the system Carrollton, Cedartown and Newman, with pipe line service under construction to Milledgeville, Rockmart and Forsyth.

R. C. Hoffman, Jr., vice-president and executive head of the Southern Cities Public Service Company and of its component companies, will become vice-president and general manager of the Georgia Natural Gas Corporation. This concern is supplied with natural gas through the main trunk pipe lines extending from the Monroe and Richland fields in Louisiana.

New High Pressure Pipe Line Completed

Gas from the new high pressure pipe line of the Northern Indiana Public Service Company, Logansport to Lafayette, Ind, has become available in this city for the first time. K. F. Dickinson is division manager of the company there. The new line is approximately 40 miles long and follows the Indiana Service corporation right of way through Delphi. It is an eight-inch welded steel pipe main with a protective coating of asphalt and tar, Completion of the line marks another step in the company's extensive gas transmission system. The new line connects at Logansport with the 10-inch high pressure gas pipe line from East Chicago and in this city with the high pressure pipe lines to Williamsport, Attica and Crawfordsville, which have been served with gas from the local plant. Construction of a distribution system at Delphi has been started by the corporation.

Memphis Natural Gas Eight Months' Sales Up 65%

Memphis Natural Gas Company reports sales of 5,658,761,500 cubic feet of natural gas during the first eight months of 1930, against 3,430,154,800 for the corresponding period of last year, a gain of over 65 per cent.

With the recent completion of additions to the company's compressor station in Guthrie, La., to provide additional supplies of gas to take care of new contracts becoming operative with the approaching heating season, and upon completion of the new Greenville-Greenwood pipeline in Mississippi, now in course of construction, a further substantial increase in volume of sales may be expected.

(*News Continued on Page 106*)

R & E CEMENTS

Developed by Specialists—
Used by Leaders Everywhere

Unmatched performances, unusually long service, correspondingly low costs —these are the experiences of others which recommend the use of R & E Cements to you.

In all industries exacting men are finding complete satisfaction with R & E Cements. In your industry that rule holds true.

Many leading companies throughout the country are standardizing on R & E Cements. Some day you will too, why not now?

May we send you a sample order for trials under your own supervision? Your money will be refunded if you are not entirely satisfied.

R & E ‡ 3000

You can't find a better cement for all-around service in gas plants. R & E ‡ 3000 air-sets to full strength; retains its bond; makes brick dislodgement impossible when "barring down"; will not crumble. Unusual adhesiveness makes ‡ 3000 extremely efficient for hot or cold patching. Fine texture permits extremely thin joints which, together with its excellent bond, is a further safeguard against bricks "pulling out."

‡ 3000 will not bloat or puff at low temperatures; does not crumble or fall when equipment is "off the line." Withstands temperatures in excess of 3000° F. Conveniently shipped ready for use in plastic form in 100 and 500 lb. steel drums. Try a drum today.

"Moldit"

We recommend Moldit for such work as monolithic floors, checker work and arches. It avoids delays in waiting for special tiles or brick. Just add a little fresh water and mold it into any desired shape.

Moldit "air-sets" and attains full strength without heat. It does not shrink and meets the most severe requirements of modern construction. You can use Moldit under temperatures up to 3000° F. It's easy to use, too. Add a little fresh water and pour—no ramming, no hammering—just mold it. Weighs only 100 lbs. molded. Shipped in convenient 100 lb. waterproof bags.

"Moldit-A"

Use Moldit-A for service under temperatures between 200° F. and 2400° F. It works the same as "Moldit" and can be used for monolithic floors, standpipes, doors, etc., any place where great structural strength is essential, or desired. Like other R & E Cements, Moldit-A air-sets and gains full strength without heat. It weigns approximately 100 lbs. per cubic foot and is shipped in 100 lb. handy waterproof bags. Order a few bags on trial today.

Data Sheets?

We have prepared a set of data sheets on refractory and insulating cements. Would you not like to have personal copies for your files?

Refractory & Engineering Corporation

Engineering & Manufacturing Specialists in High Temperature Cements.

50 Church St., New York, N. Y.

Warehouse Stocks In

Boston, Baltimore, Philadelphia, Norfolk, Pittsburgh, Chicago.

Standard Gas and Electric Shows Increase in Merchandise Sales

Substantial increases were made in merchandise sales at properties in the Standard Gas and Electric Company system for the first six months of 1930 as a result of intensified effort, according to W. H. Hodge, vice president and manager, sales and advertising department, Byllesby Engineering and Management Corporation.

Gross sales for the six months' period ended June 30, 1930, amounted to $3,550,404, an increase of 7.29 per cent over the corresponding period for 1929. The total number of electric appliances sold shows an increase in all classes of appliances with the exception of small heating units, portable lamps and lighting equipment. The total number of gas appliances sold during the six months period however shows a slight decrease.

As of June 30, 1930, there were a total of 193 stores engaged in the sale of merchandise throughout the territory served by the Byllesby operated utilities.

New Natural Gas Transmission Line Completed

The new natural gas transmission line between Atlanta and Macon, Ga., has been completed, according to the Natural Gas Engineering Corporation, which is constructing the line for the Southern Natural Gas Corporation, and gas already has been turned into the line.

The line serving Macon is 105 miles in length. From Atlanta to Griffin, the pipe is 12 inches in diameter, and from Griffin, the pipe is 12 inches in diameter, and from Griffin to Macon, ten inches. From the end of the ten-inch pipe in Macon, a line 8⅝ inches in diameter will be laid to Milledgeville, Ga., while extensions from this line will include a 6-inch branch to McIntyre, a 4-inch line to Dry Branch, and a 4-inch line to Forsyth, Ga.

Not only will these lines serve a large number of Georgia cities with natural gas, but a number of industrial plants in the section as well.

Asks Additional Natural Gas Franchises

The Billings Gas Company, a subsidiary of the Ohio Oil Company, of Billings, Montana, petitioned the Montana commissioners for permission to build a pipe line from the Big Horn Basin of Wyoming and will seek to secure franchises to serve many southern Montana cities with gas, the pipe line to extend to Butte and Anaconda, Montana.

Open New Offices and Salesroom

Formal opening of the new offices and salesroom of the Interstate Public Service Company, Goshen, Ind., was held recently. W. E. Murchie is division manager for the company here. The building has been completely remodeled and redecorated and new furnishings have been installed. The first floor is occupied by the merchandise salesroom, the accounting department and the district manager's office and the second floor provides quarters for the division headquarters and the gas operating department.

Convention Calendar

October

13-17 American Gas Association, municipal auditorium, Atlantic City, N. J. Alexander Forward, 420 Lexington Avenue, N. Y. C., managing director.

November

13-14 First Southwest Regional Natural Gas Sales Conference. Adolphus Hotel, Dallas, Texas.

Appalachian Gas Corporation Authorizes Preferred Stock Issue With Unique Payment Features

Under a novel method of payment, calling for an initial outlay of 30 per cent. and with unusual optional features regarding the payment of balance, Appalachian Gas Corporation has authorized the issuance of 100,000 shares of its $7 convertible preferred stock, series A, under allotment certificates, each of which will be exchangeable on and after July 1, 1931, upon a total payment of $1,000 plus accrued dividends, for ten shares of $7 convertible preferred stock, series A, plus ten shares of common stock.

At the outset payments under the allotment certificates will provide for the issuance of a minimum of 30,000 shares of preferred stock. This stock, which is the first preferred to be issued by Appalachian Gas Corporation since its organization, will provide funds for the acquisition of additional properties or securities, reimburse the corporation for securities previously acquired and provide funds for other corporate purposes.

Appalachian Gas Corporation owns the following percentage of outstanding stock of the following companies:

Ohio Southern Gas Corporation, 99 per cent.; West Virginia Gas Corporation, 95 per cent.; Wayne United Gas Company, 91 per cent.; Ohio Valley Gas Corporation, 83 per cent.; Texas Gas Utilities Company, 75 per cent.; Ohio Kentucky Gas Company, 59 per cent.; Memphis Natural Gas Company, 46 per cent.; Allegheny Gas Corporation, 36 per cent.

This issue of stock has been underwritten by P. W. Chapman & Co., Inc. and Reilly, Brock & Co., for later public offering.

Permission Granted To Exercise Franchises and Make Extensions

The Commission has granted the petition of the Wanakah, N. Y., Gas Corporation to extend its gas plant and exercise franchises granted to it into the towns of Hamburg, Evans and Eden, Erie County, and to capitalize its investment at $166,000 when all proposed new construction is completed. The Commission also consented to the acquisition of the capital stock of the Wanakah Gas Corporation by the Iroquois Gas Corporation.

The proposed extension will cover an area of about 22 miles long and three or four miles wide and is situated mainly along the Lake Shore Road, which includes Athol Springs, Locksley Park, Hamburg on the Lake, Mt. Vernon and Cloverbank on the north and to the south it includes Lakewood and Idlewood, on the lake, and inland Lake View and North Evans.

Three Additional Cities Added to Missouri-Kansas Pipe Line System

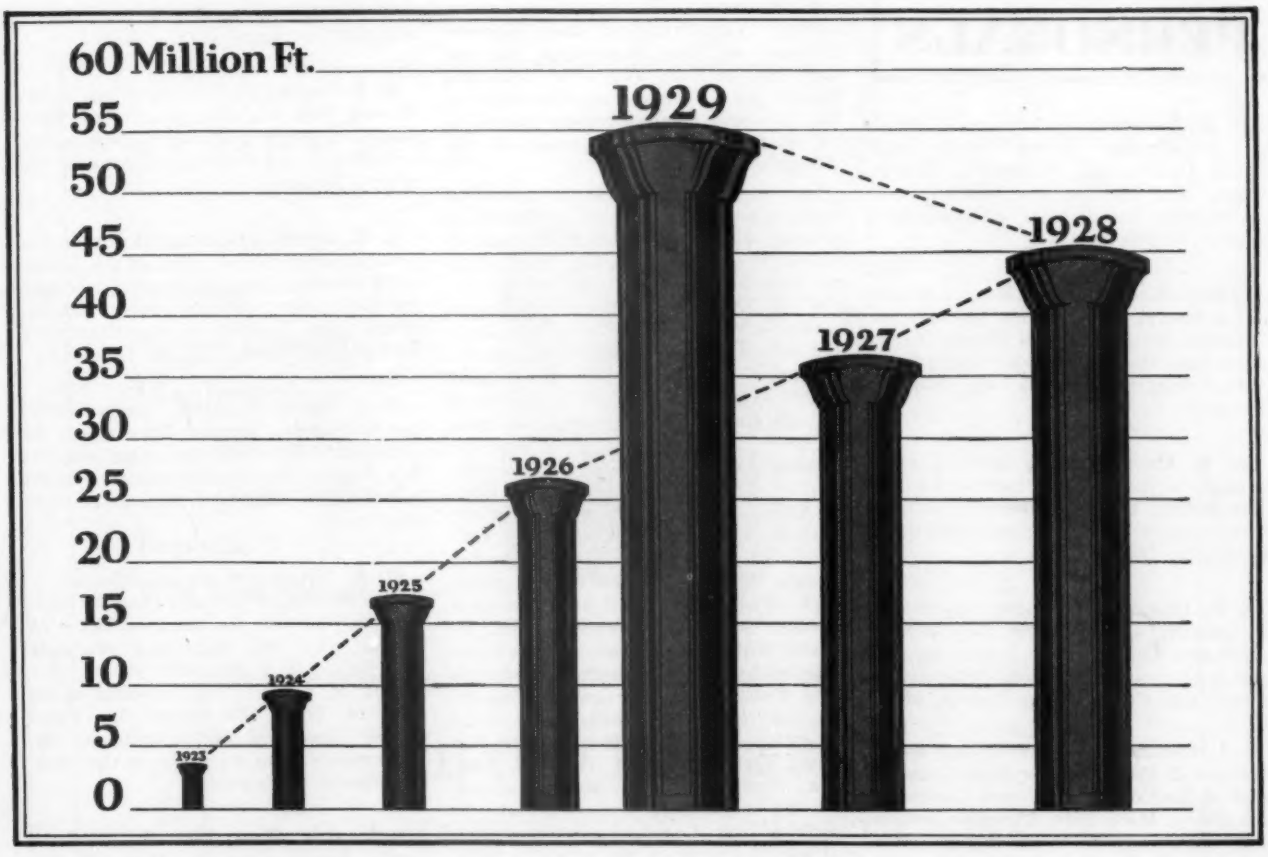
Missouri-Kansas Pipe Line Company has recently added three additional cities to its natural gas distributing system. Tell City, Ind., Bowling Green, Ky., and Whitesville, Ky. now are being served by the company. This makes twenty-seven towns and cities in which Missouri-Kansas Pipe Line Company is distributing natural gas from its own pipe lines. There are seven in Kentucky, two in Indiana, one in Illinois, seven in Missouri, including Kansas City; and ten in Kansas. The company's principal function is as a producer and transporter of natural gas but at various points in its territory where public demand exists, Missouri-Kansas also engages in distribution.

Natural Gas Supplants Oil

The Atchison, Topeka & Santa Fe Railroad Company has substituted natural gas for oil in warming up its locomotives in its Bakersfield California warehouse and finds that the gas does the work in a minimum amount of time and shows a saving of 5 percent as compared with oil burning.

File Articles of Incorporation

Articles of incorporation have been filed with the secretary of state of Indiana by the Inter-City Gas Corporation having a principal place of business at Corydon, Ind. The corporation is formed to market, sell, produce and distribute natural or artificial gas. It has an initial capital stock of 1,000 shares having no declared par value and the first board of directors is composed of M. A. Maroney, Albert H. Murphy and R. M. Johnson.



. . . *today*, more than 10,227 miles of U.S. deLavaud Pipe are in service

In December 1929, more than 54 million feet, or 10,227 miles of deLavaud Pipe — manufactured by the U. S. Pipe and Foundry Company — were in service throughout the country. A mighty fine record of acceptance for this sturdy seven-year-old product!

The first year of its manufacture in the United States, more than three million feet of deLavaud Pipe were put down. Since that time, its popularity has increased by leaps and bounds. The above chart tells the story.

Strength, flexibility and greater carrying capacity are the outstanding reasons for deLavaud Pipe's wide acceptance. DeLavaud Pipe is produced by pouring molten iron into a rapidly revolving metal mold. Centrifugal force holds the metal against the sides of the mold and drives out impurities with a force many times greater than gravity. The metal mold is encased in a water jacket, the cooling action of which brings about the remarkably fine granular structure of the iron.

Immediately after coming from the machine, every length of deLavaud Pipe is uniformly annealed in a specially constructed furnace where controlled heat eliminates all possibility of casting strains.

DeLavaud Pipe is manufactured in thicknesses and weights in strict accordance with the specifications of the American Water Works Association and the American Gas Association as well as the United States Government Specifications. The new deLavaud Handbook gives complete information. Write for your free copy today.

United States Pipe and Foundry Co., Burlington, N.J.

Our pipe bears the "Q-Check" trademark of The Cast Iron Pipe Research Association

Sales Offices:
New York, Philadelphia, Pittsburgh, Cleveland, Buffalo, Chicago, Dallas, Birmingham, Kansas City, Minneapolis, Seattle, San Francisco, Los Angeles

PERSONALS

R. B. Johnston has been made director of publicity of the Puget Sound Power and Light Company, Seattle, Wash. Mr. Johnson was formerly connected with the Journal of Commerce, Seattle, Washington.

Linton K. Starr, well known to the gas industry, and former director of publicity of the Georgia Power Company, has started his own advertising and Publicity business in Atlanta, Georgia.

W. E. Cecil, formerly division sales manager of the Illinois Power and Light Corporation, Belleville, Illinois, is now in the employ of the Skelgas division of the Skelley Oil Company.

J. T. Hammack, formerly supervisor of domestic salesmen for the Laclede Gas Light Company, St. Louis, Mo., is now sales manager of the St. Louis County Gas Co., Webster Groves, Mo.

L. L. Clemmer was recently appointed Manager of the Appliance Sales Department of the Consumers Power Company at Lansing, Mich. Mr. Clemmer served in the same capacity in the Battle Creek District.

Paul DeLeon was appointed manager of the New Business Department of the Wisconsin Power & Light Co., Madison, Wisconsin. This is a newly organized department of the company. Mr. DeLeon was associated with the company in September, 1928, when he was industrial engineer at Fond du Lac.

Sadie McNulty has been put in charge of the Home Service Department recently organized by the Wisconsin Power & Light Company, Madison, Wisconsin. Miss McNulty was connected with the Home Economics Extension Division of the University of Wisconsin for several years. She was also engaged in Farmers' Institute work at the University of Wisconsin.

Lewis M. Shreve, sales manager of the Eastern District of the Puget Sound Power & Light Company at Wenatchee, Washington, was appointed manager of that district to succeed Leslie R. Coffin, who was made manager of the Central Division. Mr. Shreve has been associated with the company since 1909.

E. T. Anderson, for the past three years general clerk of the Blackstone Valley Gas & Electric Company of Pawtucket, R. I., assumed the duties of chief clerk of this company recently to take the place of J. Carr Stewart, who has been transferred to the Accounting Department of Stone & Webster Service Corporation.

W. Rawson Collier was recently appointed Vice-President and General Manager of the Mississippi Natural Gas Corporation and the Alabama Natural Gas Corporation, Birmingham, Ala. He will be in complete charge of the operation of all properties of the Company in this State.

The new executive is a native of Georgia, having been born and reared in Atlanta, where he attended preparatory school, later graduating at Massachusetts Institute of Technology with a degree of Electrical Engineering. Upon leaving school, Mr. Collier was associated for several years with the engineering firm of Collier and Brown, acting as consulting engineer in the construction and operation of water works and electric properties. In 1922 he became associated with the Engineering Department of the Georgia Railway and Electric Company, and was engaged in the construction of steam plants and railway lines. When this company became Georgia Power Company he was made Sales Manager as well as Operating Manager of the properties. He remained with this company for eighteen years and left the South to become Sales Manager of the Central Hudson Gas and Electric Company operating properties in the Hudson Valley between Tarrytown and Albany, New York. Subsequently he was associated with the engineering firm of Dwight P. Robinson and Company, Incorporated, and was in charge of the southern territory of this widely known engineering firm covering territory from Washington to Texas.

Mr. Collier comes to the Mississippi and Alabama Natural Gas Corporation from the southern managership of Hall Electric Heating Company, a subsidiary of General Electric.

Lloyd McIntyre, former New Business Manager of the Hutchinson Gas Company has been transferred to Beloit, Kansas, as New Business Manager there.

G. W. Swartz has been chosen by M. B. Buckley, New Business Manager of the Kansas City Gas Company, to be one of the supervisors of the department.

Mr. Swartz has been with the Kansas City Gas Company since the fall of 1925. He first worked in the industrial division selling industrial equipment. He was then made house-heating engineer and the first of this year he was made assistant territory supervisor.

H. S. Hicks has been named to head the Gas Service Company's new properties in Central Northern Kansas and at Superior, Kansas. Mr. Hicks will be manager of the gas property in some nineteen towns extending from Ellsworth, Kansas, on the south to Superior, Neb., on the north. Mr. Hicks was new business representative of the Union Public Service Company at Merriam.

Mr. Hicks has been with the Doherty organization since 1915.

R. P. Pitman, former supervisor at the Kansas City Gas Company, has been placed in charge of New Business activities of the Gas Service Company at Superior, Kansas.

J. E. Kern, Sales Supervisor in the New Business Department of the Southern California Gas Company, Los Angeles, Calif., was a prize winner in the National Sales Contest of the Electrolux Refrigerator Sales, Inc., of Illinois.

V. J. Lewy, formerly Supervisor of the Industrial Service Bureau of the Southern California Gas Company in Los Angeles, has been transferred to the San Joaquin Valley Division as Division Engineer.

H. R. Kruse was named sales manager of the Puget Sound Power & Light Company to take the place of Lewis M. Shreve who was appointed manager. Mr. Kruse is a graduate of the University of Washington, finishing in the class of 1923. He joined the Puget Sound Power & Light Company the same year, taking a position in the meter department in Seattle.

Bernard T. Poor, formerly industrial service engineer for the Haverhill Gas Light Company, was transferred to the Fall River, Mass., Gas Works Co., in the same capacity.

James Farrell formerly general foreman of the gas distribution department of the Consumers Power Company, Pontiac, has recently been transferred to Jackson, Mich., as construction superintendent for the Allied Engineers, Inc. S. E. Kline succeeds Mr. Farrell as general foreman at Pontiac.

E. P. Taafe, formerly purchasing agent of Philadelphia Electric Company, was appointed an assistant purchasing agent of the United Gas Improvement Company, Philadelphia, Pa. The Purchasing Department of the Philadelphia Electric Company was dissolved and the personnel of that department was transferred to the Purchasing Department of the United Gas Improvement Company.

Mr. Taafe was employed by Philadelphia Electric Company in 1899, as a clerk, and since then had held the positions of storekeeper, buyer, assistant purchasing agent, and purchasing agent, having been appointed to the latter position in 1923.

Ralph P. Ormsbee was recently appointed assistant general manager of the Narragansett Electric Company, Providence, R. I. Mr. Ormsbee was superintendent of distribution. Mr. Frederick G. Harriman, assistant superintendent of distribution succeeds Mr. Ormsbee as superintendent of distribution.

SUPERIOR

Gas Meters
Provers
Service Cleaners
Diaphragms
Semi-Chrome
Bark-Tanned
Repairs
Wet Test Meters

BOOTH 231

A. G. A. CONVENTION, ATLANTIC CITY

In attendance:

JOHN H. WALSH
JAY M. GRADY
THOMAS J. MARTIN
F. W. GOTTSCHLING

SUPERIOR METER CO.

Bush Terminal Bldg., No. 20
Brooklyn, N. Y.

TRADE NEWS

United Engineers & Constructors, Inc.—Activities

The Rosslyn Gas Company of Rosslyn, Virginia, has awarded contract to furnish, deliver and install 22,400 feet of 8" welded steel main, 21,760 feet of 6" welded steel main, 11,035 feet of 4" welded steel main, and 12,750 feet of 3" welded steel main, which work will be done by the Distribution Department.

The Central Indiana Gas Company, of Muncie, Indiana, has awarded contract to furnish, deliver and install 18,000 feet of 4" welded steel main between Dunkirk and Redkey, Indiana, 58,225 feet of 6" welded steel main between Shiedler and Hartford City, Indiana, and 94,131 feet of 8" welded steel main between Muncie and Shiedler and Shiedler and Dunkirk, Indiana.

Contract has been awarded to furnish one 9'0" x 40'0" Steam Accumulator, for the West End Works of the Public Service Electric & Gas Company, Jersey City, N. J.

Surface Combustion Co. Acquires Control of Chapman-Stein Co.

Mr. Frank H. Adams, Vice President and General Manager of the Surface Combustion Company, announces that negotiations have just been completed for the transfer of control by exchange of stock of the Chapman-Stein Company, a subsidiary of the Cooper-Bessmer Corporation of Mt. Vernon, Ohio, to the Surface Combustion Company of Toledo, Ohio, a Henry L. Doherty subsidiary. Both Companies have been outstanding manufacturers of industrial heating equipment in their respective fields. Chapman-Stein Company have specialized in soaking pits and the roughing operations of the steel industry while Surface Combustion has specialized in gas fired industrial furnaces for finishing operations in the steel mill and the automotive fields.

Both B. B. Williams, President of the Cooper-Bessmer Corporation, and Henry L. Doherty announce the purpose of the merger is to permit more rapid development of furnaces and processes for the more efficient use of gas. The rapid expansion of natural gas distribution, in which both companies are heavily interested, has given a great stimulus to the use of gas for all heat treating operations.

The entire Chapman-Stein organization will be transferred to Toledo in the near future. George McDermott, General Manager of the Chapman-Stein Company, is becoming Vice-President and Chief Engineer of the Steel Mill Division of the Surface Combustion Company.

New Bulletin On Jenkins Bronze Valves

The new Bulletin No. 141 which fully describes and illustrates Jenkins Standard Bronze Valves with the one-piece screw-over bonnet and slip-on stay-on disc holder has just been announced by Jenkins Bros., 80 White Street, New York.

The valves described are made in globe, angle, cross and check types for all standard services. The globe valve is designated as Jenkins Fig. 106-A.

The one-piece screw-over bonnet in combination with the slip-on stay-on disc holder is an entirely new departure in bronze valve design. The one-piece bonnet construction provides ease in removal, and contributes unusual strength, which, it is claimed by the manufacturer, prevents springing or distortion, even though the bonnet is removed and replaced repeatedly. The valve throughout is heavily proportioned.

The slip-on disc holder facilitates changing the disc. If the spindle is raised just a turn or so, the bonnet can be removed from the valve body without danger of the disc holder slipping off the spindle. Then a turn or so in the opposite direction and the disc holder slips off the spindle.

A copy of this new bulletin giving details about these valves may be obtained by writing the manufacturer.

Brown Instrument Co. Issues New Pyrometer Catalog

A new catalog featuring Brown Indicating, Recording and Automatic Control Pyrometers has just been issued by the Brown Instrument Company, Philadelphia, Pa. This catalog contains 104 pages with 141 illustrations, many of which are in two or more colors. A comprehensive resume of the theory and practice of applied pyrometry is presented, together with descriptions and illustrations of all instruments, thermocouples, protecting tubes and other required equipment.

Pittsburgh Equitable Meter Make Plant Additions

Work has been completed on two new additions to one of the great Pittsburgh Equitable Meter Company plants at Pittsburgh. The necessity of again increasing the floor space to meet the adequate needs for the manufacturing program that must follow because business has increased in such volume, made this construction imperative.

Approximately 100,000 sq. feet of additional floor space is available through these additions. The equipment to be installed will be of the most modern and efficient type. Much of it has been designed by E. M. C. O. engineers to meet the exacting manufacturing needs. These mark the fourth addition to the Pittsburgh Equitable Meter Company plants within two years.

Large Order for Electric Welded Steel Pipe Received by Republic Steel Corp.

The Republic Steel Corp., has received an order for 110 miles of electric welded steel pipe for shipment to large natural gas interests in the southwest. The company now has all three units of its electric welding pipe plant at Youngstown at capacity operations, the last unit being started a few days ago. Unfilled orders on hand are sufficient to maintain a high rate of activity, for the plant through the late fall, according to company officials.

Brown Instrument Co. Issues Unique Booklet on Automatic Controls

The Brown Instrument Company, Philadelphia, Pa., recently issued a unique 32-page booklet entitled "The Era of Automatic Control." It is unique in that there is very little reading matter, but every industry that uses automatic control devices for heat, pressure or flow of liquids and gas in the manufacture of their products, has a photographic reproduction of a part of the plant showing the position of the various instruments particularly suited to that kind of work. A page is devoted to each industry. Several illustrations are of particular interest to the manufacturing, distribution and industrial branches of the gas industry. A copy of the booklet will be mailed on request.

New Gas Range Merchandise Booklet

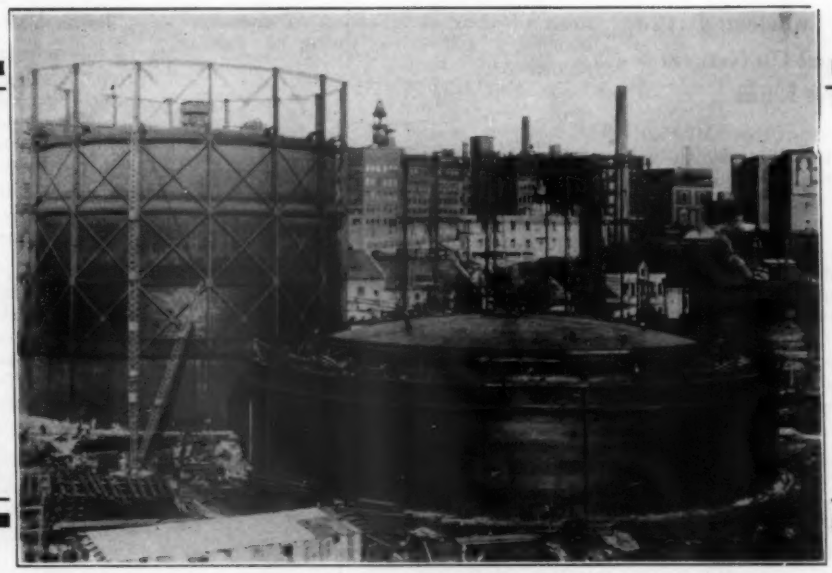
"This New Cooking" is the title of an attractive booklet in color just issued by the Standard Gas Equipment Corporation, 18 East 41st Street, New York City. This booklet describes the advantages of Smoothtop gas ranges and is part of a complete merchandising program which is available to those interested.

Change in Foxboro's N. Y. Office

Mr. C. C. Fuller has been recently appointed manager of the Foxboro Company's New York Office. He replaces the late W. W. Patrick.

Mr. Fuller is already widely known in the Metropolitan Area.

(Trade News Continued on Page 112)



Construction view of 5,000,000 cubic foot holder (No. 11) of the Rochester Gas & Electric Corp., Rochester, N. Y. CE-CO Holder Paints are protecting all the Holders of this company

GIVE YOUR HOLDERS LONGER LIFE
and BETTER APPEARANCE *with*
CE-CO GAS HOLDER PAINTS

Many thousands of gallons of CE-CO Gas Holder Paints are used by leading gas companies every year to lengthen the life of holders by warding off rust and corrosion.

Ce-Co Holder Paints have a double purpose—to protect and to beautify. In numerous colors, they blend with the sky, landscape and surrounding buildings. Nearby, your holder is more attractive. At a distance, it is almost invisible.

The old reliable No. 31 "Williamsport Red" has never been outdone in durability. Its color is an exceptionally rich shade of red, which is retained throughout the life of the paint. It combines great weather durability with resistance to sulphur gases and dilute acid and alkaline fumes.

There is much helpful data in our two special bulletins, "Low Visibility," and "Color Harmony," which contain many suggestions for beautifying and preserving your Gas Holders.

Other CE-CO Technical Paints for Public Utility Companies.

Metal Preservative Paints
Aluminum Paints
CE-CO Lower Lift Holder Paints
CE-CO Fume, Acid and Alkali Resistant Paints
Newlite Interior White
CE-CO Wall Size-Filler
CE-CO Dado Enamel
CE-CO Suspended Red Lead
Cement Floor Coatings
CE-CO Engine Enamel
CE-CO Pipe Enamel
No. 795 Underground Pipe Coating
Bituseal Interior Undercoat and Bituseal Exterior Paints
CE-CO Gas Generator Paint
CE-CO Stack Paints
CE-CO Galvanized Iron Paint
CE-CO Hi-Degree Gray Coating
CE-CO Meter Enamels
CE-CO Pipe Covering Size-Filler
CE-CO Creosote Sealer
Cecotite Roof Coating, etc.

CHEESMAN-ELLIOT COMPANY, INC.

Established 1876
TECHNICAL PAINT MAKERS
639-647 Kent Avenue — Brooklyn, N. Y.
Works at Brooklyn, N. Y. and Williamsport, Pa.

Send This Coupon To-Day!

Cheesman-Elliot Company, Inc.
639-647 Kent Avenue, Brooklyn, N. Y.

We want to preserve and beautify our gas holders. Send literature and color cards telling us how this can be done.

Name .....
Position .....
Company .....
City ..... State .....

Valves of the Lubricated Plug Cock Type Used On Natural Gas Pipe Lines

The new pipe line of the Missouri-Kansas Pipe Line Company which will run from Southwest Kansas to Indianapolis will include many valves of the lubricated plug cock type. The larger of these valves will be used as main block valves for by-passing compressor stations and also on the inlets and outlets to compressors and compressor by-passes. Additional applications will include the gas cooler lines and scrubbers, air-starting valves and tower valves on the engines and drip valves along the main line.

The new Natural Gas line from the Panhandle of Texas to Chicago being constructed by the Continental Construction Company will also be equipped with 24" Cast Steel Lubricated Plug Cocks of the Venturi type as main block valves at the compressor stations. The drip valves on the main line will also be lubricated plug cocks.

Commitments for the manufacture of these valves have been received by the Merco Nordstrom Valve Company.

Pittsburgh Equitable's New Los Angeles Plant

To give the Pacific Coast better service, the Pittsburgh Equitable Meter Company opened a new branch factory at 1918 East 7th Street, Los Angeles, California. A complete line of water, gas, oil and gasoline meters and pressure regulating equipment is carried in stock ready for immediate delivery. Any necessary repairs to equipment installed on the Coast can be made here.

C. Russell Turner Admitted to Partnership in E. Paul Young Co.

C. Russell Turner, prominent in New York financial circles, has been admitted to partnership in the firm of E. Paul Young & Company, New York, specialists in customer ownership financing.

Mr. Turner, who has been associated with Mr. E. Paul Young for several years in an executive capacity, has a background of wide financial experience—particularly in the management of campaigns for the creation of new business, the sale and distribution of employe and customer stock and savings plans for industrial workers.

Under the extended plans of operation, both Mr. Young and Mr. Turner will be in the field much of their time. Because of the wide interest manifested and the big demand at present on the part of many public utilities corporations and other manufacturing concerns for customer ownership campaigns, these partners will devote practically their entire time and full facilities of this department of their organization to customer ownership and other forms of junior financing.

F. G. Schneeberg, Jr., Now New York Sales Manager of Bernitz Furnace Appliance Co.

Mr. Fred G. Schneeberg, Jr., has succeeded Mr. E. R. Jefferson as District Sales Manager of the New York Office of the Bernitz Furnace Appliance Company, located at 350 Madison Ave., New York City. Mr. Schneeberg has been connected with the Bernitz Furnace Appliance Company as Sales Engineer for some time.

C. B. Nolte Elected President of Robert W. Hunt Co.

John J. Cone, President of Robert W. Hunt Company, Engineers, Chicago, and a member of that company since its organization in 1888, has retired. C. B. Nolte, Vice-President and General Manager, has been elected president and general manager of the company, with headquarters at the general office, Chicago. J. C. Ogden, a Director and Eastern Manager of the Company, has been elected vice-president, with headquarters at New York City.

Security Dealers Inspect Natural Gas Property

Furlaud, Reuter & Company, Inc., New York Investment Bankers, who sponscored the merger of the Duquense Gas Corporation and who are specialists in natural gas securities, concluded a two day session inspecting the property near Pittsburgh, September 4 and 5. They were hosts to a group of fifty Security Dealers, who spent two interesting days in the vicinity on the inspection trip.

They made their headquarters at the William Penn Hotel, where formal banquet was served during the stay. The speakers included M. H. Furlaud and Carlos Reuter, of Furlaud, Reuter & Company, Inc.; W. C. Krog, President and Chas. C. Nuss, Vice-President of the Duquense Gas Corporation; John J. Bergen, affiliated with important banking interests in New York, and Eugene L. Garey, New York attorney. J. H. Newmark of New York acted as toastmaster.

Chicago Distributor

Babcock & Wilcox No. 80 Refractory Cements and Plastics are now being exclusively distributed in the Chicago territory by Mayer & Oswald, Inc., 332 South LaSalle St., Chicago, Ill.

Joins Pittsburgh Equitable

In line with the policy of departmentalizing its sales organization and placing experienced group specialists at the disposal of the industries it serves, the Pittsburgh Equitable Meter Company has added Mr. Frank J. Reynolds to its sales force. Mr. Reynolds will be associated with the Emco Orifice Meter and Emco Gauge Department.

He has had ten years of successful selling experience with the Bristol Company of Waterbury, Connecticut, during which time he specialized upon the introduction of similar new equipment in a variety of industries from coast to coast. This background especially qualifies him for his new duties.

He will be located at the home plant in Pittsburgh, Pennsylvania.

Worthington Improves Financial Status

In addition to maintaining good earning power, the Worthington Pump and Machinery Corporation, Harrison, N. J., further improved its financial status during the first half of the year.

As of June 30, current assets were $17,525,690 against current liabilities of $1,225,722. Cash, call loans and government security holdings alone aggregated $6,920,560 and were 465% in excess of total liabilities. As of the same date, inventories totaled $5,662,733; reserves, $1,674,920; and surplus, $5,701,103.

For the first six months of 1929, the corresponding figures were: Current assets, $16,532,255; current liabilities, $813,707; cash, call loans and government securities, $5,645,932; inventories, $6,646,069; reserves $1,896,662; and surplus, $5,028,025.

Worthington's net income of $1,052,732 for the first half of 1930, after deducting all charges including taxes and depreciation, was substantially larger than the total net reported for each of the full years 1922 to 1928, inclusive. It was only $46,696 less than that reported for the corresponding period of 1929.

The first half net of this year was equal to $4.31 a share on the 126,921 shares of $100 par common stock outstanding, compared with $4.57 a share on 129,921 shares of common issued in the first half of 1929.

Darling Valve Open Pacific Coast Offices

The Darling Valve & Manufacturing Company recently announced the opening of their new Pacific Coast offices and warehouse at 2450-56 Hunter Street, Los Angeles, California. Harry L. Carr has been appointed manager.

GREETINGS:—

To All Gasmen assembled for the 12th Annual Convention of the American Gas Association, we extend Heartiest Greetings, and appreciation of their good-will.

COLONIAL BRAND

RE-CHROME METER LEATHER

BESSE, OSBORN & ODELL INC. · COLONIAL BRAND · BOSTON, U.S.A. · RE-CHROME METER LEATHER

This trade-mark stamped on each New Zealand Lamb skin, is our guarantee to you that each skin has received the greatest care in its selection and tanning.

"Colonial" Re-Chrome has many proven advantages over bark-tanned leather, and is the most satisfactory and the best leather for use in Diaphragms in New Meters and Repair Work.

Is used by many of the Largest Gas Companies in the country.

Also for— GOVERNORS and REGULATORS

1 Longer years service, hence less repairs.

2 More impervious to water. Will stand a five minute boiling test.

3 Greater resistance to heat and climatic changes.

Manufacturers of Governors and Regulators are finding "Colonial" Re-Chrome Leathers superior to bark-tanned leather where durability, flexibility and ease of fabrication, combined with their other outstanding features, are essential to the efficiency of their product.

BESSE, OSBORN & ODELL, INC.

51 SOUTH STREET - BOSTON, MASS.

New York—177 William Street
W. A. Smith—G. Norman Bankart, Representatives.

***Tanneries:* Clinton, Me. *and* Peabody, Mass.**

KITSON PATENTED HIGH PRESSURE VALVE

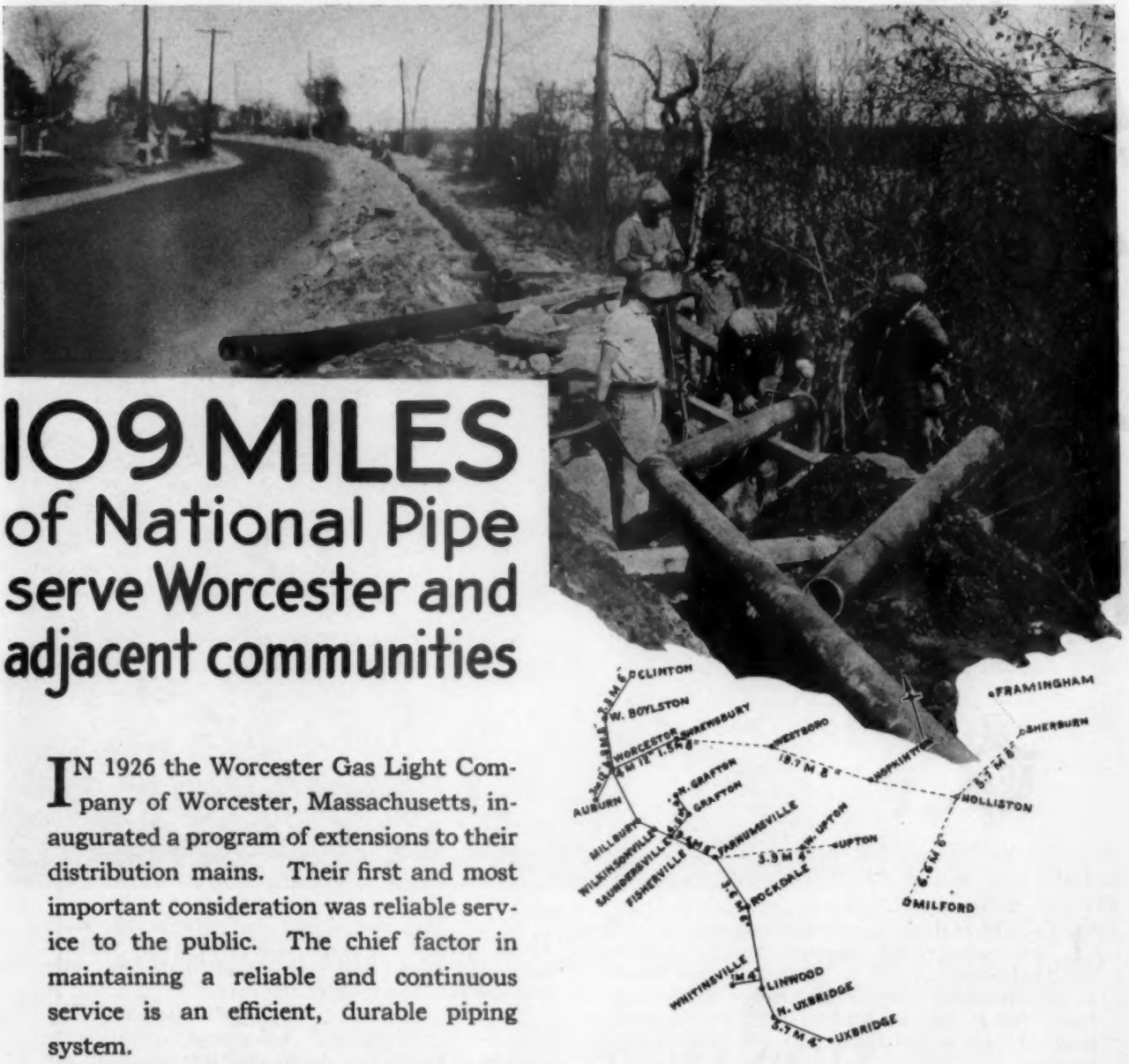
LOW INSTALLATION & MAINTENANCE COST
GAS TIGHT UNDER ALL PRESSURES
EASY TO TURN ON OR OFF—NEVER BINDS
SELF CLEANING—CANNOT CLOG
ALIGNS EASILY WITH SERVICE AND REGULATOR LINES THEREBY REDUCES SERVICE LINE BREAKS

KITSON COMPANY

Subsidiary of Wellsbach Street Illuminating Co.

District Representatives—Baltimore, Chicago, St. Louis, Boston, Cincinnati, Cleveland, Detroit, Pittsburgh, San Francisco
GENERAL OFFICES 261 N. BROAD STREET PHILADELPHIA, PA.

The Worcester Distribution System . . .



109 MILES of National Pipe serve Worcester and adjacent communities

IN 1926 the Worcester Gas Light Company of Worcester, Massachusetts, inaugurated a program of extensions to their distribution mains. Their first and most important consideration was reliable service to the public. The chief factor in maintaining a reliable and continuous service is an efficient, durable piping system.

The selection of NATIONAL Pipe for the first extension proved so thoroughly satisfactory that for each successive extension every year up to the present time the use of NATIONAL has been repeated. 109 miles are now in operation, with an additional extension under way. Worcester's experience is typical of that of many other gas companies who have learned the real value of standardizing on NATIONAL—

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
Subsidiary of United States Steel Corporation

NATIONAL PIPE

AN "ACE IN THE HOLE"

TOUGH SOILS, narrow working-spaces, surface and underground obstacles, short, widely-scattered extensions, and all the other conditions attendant to gas trenching form a combination that's hard to beat. But if you own a Cleveland Baby Digger, you have an "ace in the hole" that will beat this combination.

Only 58" in extreme width, it is evident that the Baby Digger digs alongside or between obstructions requiring minimum clearance. Weighing approximately 4 tons, it has unrivalled mobility. It loads or unloads in less than five minutes on its own specially-built trailer and travels to the next location at truck speed.

Its lack of excess weight also permits it to work across driveways, walks and tree-lawns without damaging them, and across soft "fills" etc. with less danger of miring.

Amply powered with its rugged wheel-type digging boom and backed by its super-quality construction, the ability to handle the toughest and hardest soils is assured. Digging-speed aplenty, in a wide range, guarantees a maximum day's turnout for every soil condition.

Own a Baby Digger and be prepared to meet the unforeseen conditions on your next job. Write today for catalog No. 10 and complete specifications.

THE CLEVELAND TRENCHER COMPANY

"Pioneers of the Small Trencher"

20100 St. Clair Ave. **Cleveland, Ohio**

The CLEVELAND BABY DIGGER

See this pipe at Booth 603 at Atlantic City A.G.A.

Are you going to cut that paving *again?*

IN horse-and-buggy days, when traffic and pavements were light, it was not so serious a matter to cut a pavement in order to replace or repair a rusted main.

But now, you think twice before you go into that concrete! And to give you permanent pipe in small as well as large sizes is the aim of *McWane* cast iron gas pipe with its various types of gas-tight joints.

No Coating or Coddling

McWane cast iron gas pipe has not only a low cost per year but a low cost per foot. Because it is laid once and forgotten. No preliminary coating is necessary to insure that it will "serve by the century." And McWane joints hold gas.

Cast Iron Pipe *Lasts*

Cast iron pipe for gas is finding new favor since McWANE has perfected a pipe modern in weights and strengths yet retaining every virtue of the old time sand cast pipe. McWane is SAND CAST. And it *lasts*. So do McWane joints.

McWane Superiority

is summed up in straight, uniform pipe; strong yet easy to cut and tap. Ships well and lays well. B. & S. plain ends, McWane threaded (without couplings) or with Flexpan Joints. For pressures to 100 lbs.

See it at Booth 603, Atlantic City A. G. A.

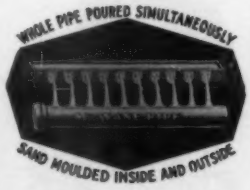
Sizes: 1¼ to 12 Inches

WRITE FOR ILLUSTRATED LITERATURE

McWANE CAST IRON PIPE CO. BIRMINGHAM, ALA.

PACIFIC STATES CAST IRON PIPE CO. PROVO, UTAH

SALES OFFICES IN PRINCIPAL CITIES



McWANE CAST IRON PIPE

Darling Valves Are Truly Economical

You may pay a little more for Darlings than ordinary valves, but actually you are getting a bargain—the most for your money.

Although you find them no bigger, or prettier, or heavier than others at the same price, you will learn after getting years of trouble-free service that Darlings have a lot more *in* them in the shape of easy operation, extraordinary long life, and fewer repairs.

The hows and whys of Darling's superiority are well explained in our Bulletins. We will gladly send them upon request. Write the nearest branch office today.

Darling Valve & Mfg. Co.

Williamsport, Penna.

New York Los Angeles Oklahoma City Houston

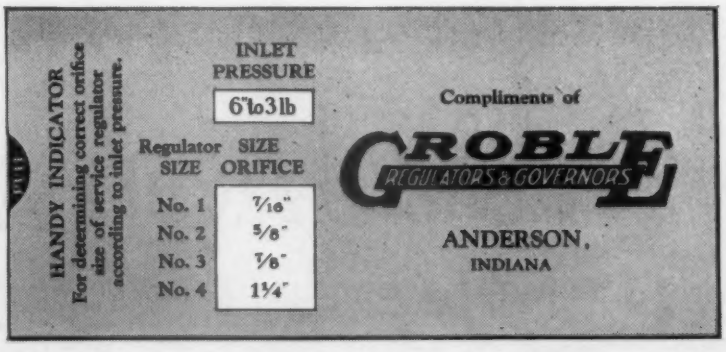
DARLING
GATE VALVES

STOP

AT BOOTH

731

AND RECEIVE ONE THESE HANDY INDICATORS WITH OUR COMPLIMENTS



WHILE YOU ARE THERE BE SURE TO SEE THE MOST ACCESSIBLE LINE OF REGULATORS ON THE MARKET

BUILT FOR SERVICE

GROBLE
REGULATORS & GOVERNORS

Groble Gas Regulator Co., Anderson, Indiana

Faraday

REFRIGERATOR CORPORATION

A new subsidiary of General Motors Corporation

Announces the

FARADAY REFRIGERATOR CORPORATION

PRODUCT OF
GM
GENERAL
MOTORS

Faraday

ABSORPTION REFRIGERATOR

Embodying entirely new developments of the absorption principle of refrigeration.

•

NEW SIMPLICITIES • NEW PRINCIPLES • NEW BEAUTY

•

Be sure to see this latest achievement of General Motors Engineers at the Atlantic City Show...October 13th to 17th, inclusive.

Booth numbers 837-838-839

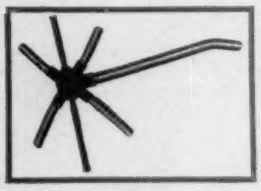
Subsidiary of General Motors Corporation: Dayton, Ohio

"PATROL"

REG. U.S. PAT. OFF.

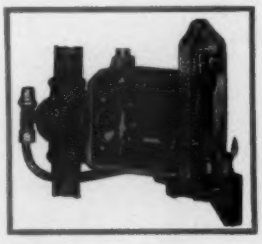
PRODUCTS SHOWN AT A·G·A EXHIBITION

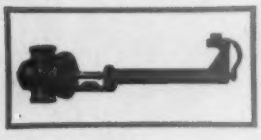
ATLANTIC CITY, OCTOBER 13-17



Patrol-Flash Lighter. Featured on live display showing its electric-like, positive ignition of both top and oven burners. Equipped with Patrol Bellows Safety Valve. New model adjustable to various positions, yet cannot jar out of alignment.

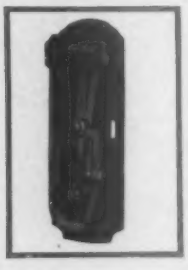
Patrol Valve—The pilot safety valve that works and works and works and is consequently always in trim. With each operation of the automatic gas temperature control, the Patrol Valve opens or cuts off the main gas supply. It cannot stick through corrosion.





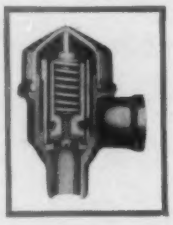
Cut-Off Valve, Bi-metal operated safety pilot control. Combines sturdy and simple construction with economy. It can be adapted to a wide variety of appliances.

Bellows Valve, pilot control for gas ranges, and a wide variety of other appliances made possible by its flexible tube construction.



Patrol Room Control. Used with Patrol Valve comprises complete, low cost, temperature regulation for heating systems. Installed on wall of living room or other convenient location.

Patrol Temperature and Pressure Relief Valve. Universal in application to hot water storage supply tanks.



THE PATROL VALVE COMPANY

COR. LOCUST AVE. AND W. 114th ST. CLEVELAND, OHIO

NEW ECONOMY

FROM STILL HIGHER EFFICIENCY OF BARBER CONVERSION BURNERS

CUSTOMERS of yours who are still heating their homes with coal for economy's sake, in spite of the work and dirt, can now lay aside the shovel and the ash basket and enjoy the modern comfort and satisfaction of gas heat.

The new line of BARBER Automatic Conversion Gas Burners provides the means. They are lowest in cost of any high grade automatic conversion burners, prices ranging from $72.50 up. They are easy to install. They fit any size or shape of furnace or boiler *exactly* and they achieve an efficiency that compares favorably with custom-built gas-fired heating outfits.

This economical efficiency comes from the patented BARBER jet principle with its twin-flame reaching a higher temperature than any mixer-type burner; and the BARBER method of applying the heat directly to heating surfaces.

You can increase your "load" materially this winter by selling BARBER Burners to hundreds of medium size homes in your city that need only the BARBER news to convert them. Write for our book, "More Gas" which contains a complete sales plan for you.

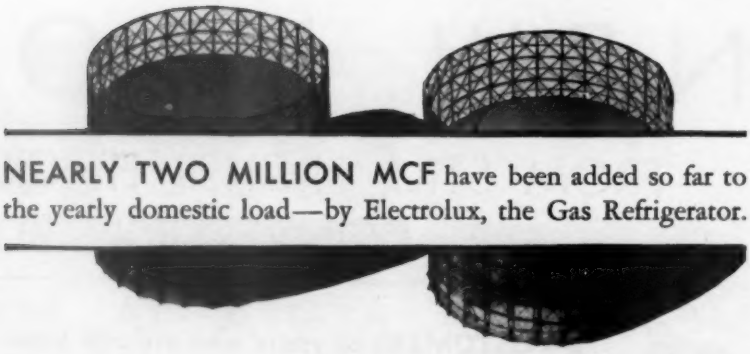
BARBER Special Burner Assembly for rectangular boiler made up of 6 U-17 units, Minneapolis Motor Gas Valve, automatic and fully equipped. Fitting the boiler is accomplished by assembly of standard units.

Whether furnace or boiler, whether round, square or rectangular, BARBER Gas Burners are made to fit it perfectly and are placed to attain the utmost efficiency. The illustration shows 4 U-25 BARBER Burner units and complete automatic equipment.

BARBER *Automatic* JET GAS BURNERS

THE BARBER GAS BURNER CO., 3702-4 SUPERIOR AVE., CLEVELAND, OHIO

FORMERLY THE CLEVELAND GAS BURNER & APPLIANCE CO.



NEARLY TWO MILLION MCF have been added so far to the yearly domestic load—by Electrolux, the Gas Refrigerator.

TODAY . . . ELECTROLUX consumes *more* gas than 4 cities the size of Savannah

"Already the sale of gas in the United States has been increased nearly 2,000,000,000 cu. ft. annually —thanks to Electrolux," says Clifford D. Paige, vice-president of the A. G. A. "And I am fully confident that the future of domestic load building will be closely related to the development of gas refrigeration."

ON AUGUST 26, the 110,000th Electrolux refrigerator was installed. Electrolux now enters the second stage of its rapid and phenomenal growth. In less than three years, Electrolux has achieved nation-wide recognition. It has built an acceptance that other automatic refrigerators have taken many times as long to acquire.

To the active cooperation of the gas companies of this country goes a large share of the credit for this amazing sales growth. Astute leaders in the gas industry were quick to grasp the load-building significance of Electrolux. Today, the sendout of four average cities of 100,000 population would not supply gas enough to run all the Electrolux refrigerators now in operation.

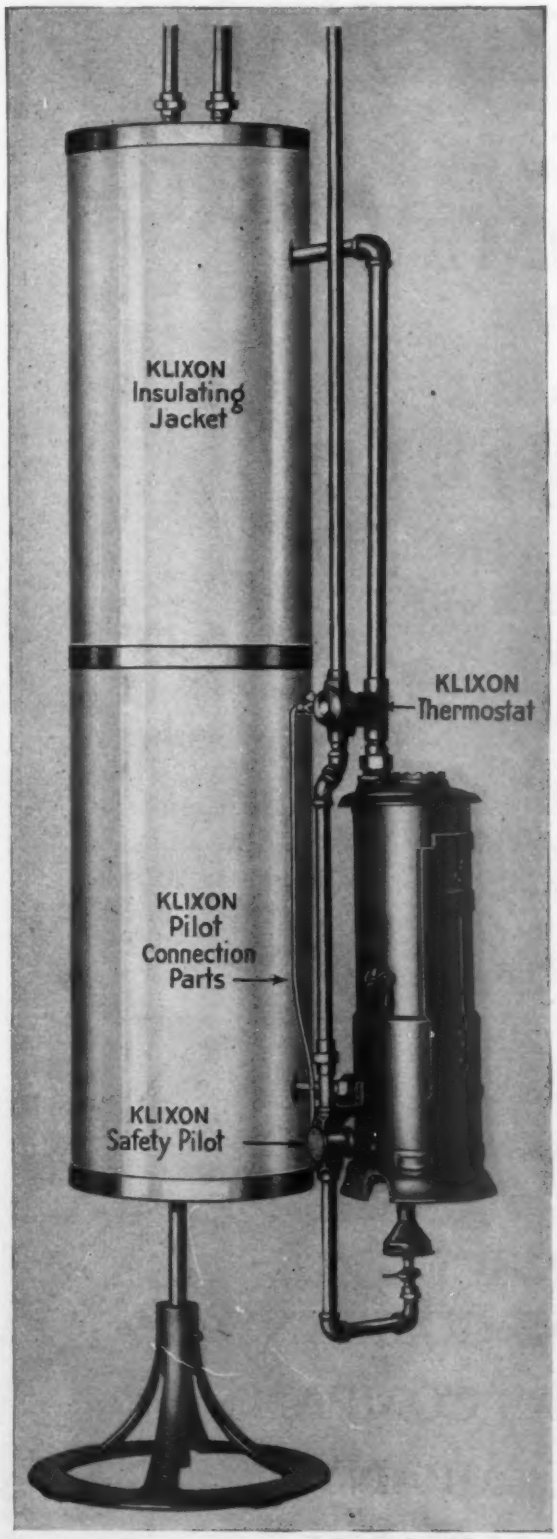
THE KITCHENETTE, *one of the popular Electrolux models, increases your domestic load 1500 cu. ft. monthly.*

But the market for gas refrigeration has only been scratched. Less than 10% of the homes in the United States have automatic refrigeration of any description. This low figure cannot be attributed—in any great extent—to lack of sufficient income. Last year, a study of 11,000 automatic refrigerator users showed that over one-third received incomes of $2,500 or less. More than half had incomes of not more than $3,000. And this does not take into account the growing market for automatic refrigeration in new apartment constructions and remodelled buildings.

Your community offers a rich sales outlet for Electrolux. Don't fail to take advantage of it! Every Electrolux installed adds 1500 cu. ft. monthly to the domestic load. Gives you a generous profit from the sale itself . . . provides a strong impetus to the sale of other gas appliances. We've prepared a series of sales pieces that will help you close these profitable sales. Ask us about them today. Write, wire or telephone Electrolux Refrigerator Sales, Inc., Evansville, Ind.

ELECTROLUX

THE *Gas* REFRIGERATOR



KLIXON

Announces a Complete Kit for Converting TANK HEATERS

CERTAIN progressive gas companies have made wonderful records converting manually operated gas water-heaters into automatic hot-water storage systems by means of the KLIXON Thermostat No. T. G. 13-P. Now KLIXON announces a complete new kit for this profitable business.

COMPLETE. In addition to the famous KLIXON T. G. 13-P Thermostat, this kit contains

KLIXON Kit

everything necessary to do a complete, safe, and handsome job. Each kit contains a thermostat, safety pilot (and accessories), and a 3-ply, air-cell, asbestos boiler insulating jacket. Everything is there, easy to install, to make a handsome job at very low cost. You do not have to drill the boiler, therefore the cost and time for installation is cut in half.

RELIABLE. The KLIXON T. G. 13-P Thermostat has been used to convert thousands of heaters. This thermostat is one of the well known line having exclusive use of the famous Spencer thermostatic disc. It is a tested mechanism approved by leading scientific and engineering organizations. It is used in many famous products.

KLIXON
Thermostat
T. G. 13-P

SAFE. The KLIXON kit contains a KLIXON B-1226 Safety Pilot, which should be a part of every automatic storage system. Again we offer a thoroughly tested product, complete with all fittings.

KLIXON B-1226
Safety Pilot

PROFITABLE. Gas Companies find these conversion jobs doubly profitable as a merchandising and load-building proposition. Every housewife wants automatic hot water and now you can offer it,—a handsome job at a price that is sure to make sales under present business conditions. The owners of thousands of manually operated heaters cannot afford to throw away their present equipment. They do not need to with this KLIXON kit.

SEND FOR PRICE SHEET AND FULL DATA

SPENCER THERMOSTAT CO

CAMBRIDGE · · · MASS

WELCOME
TO
NEW JERSEY
A. G. A.

COMPANIES in the Public Service System serving some 288 New Jersey Municipalities with gas, extend to the officers and delegates of the Twelfth Annual Convention of the American Gas Association a cordial welcome to New Jersey and Atlantic City.

PUBLIC SERVICE
ELECTRIC AND GAS COMPANY
ATLANTIC CITY GAS COMPANY
PEOPLES GAS COMPANY
COUNTY GAS COMPANY

WELSBACH leadership

during periods of keen competition always insures you steady sales . . .

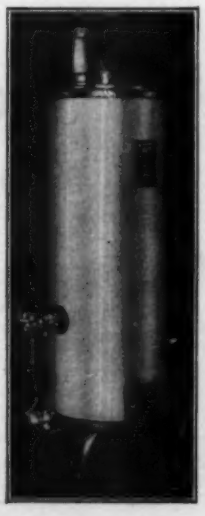
WELCOME

•

We shall be glad to see you at the Welsbach BOOTH NUMBER 112 American Gas Association Convention in Atlantic City, October 13th to 17th inclusive.

These are days of careful buying. Close scrutiny of value is the rule . . . And the name Welsbach, backed by 40 years of earned leadership in the gas appliance field, is recognized by Commercial Managers more fully than ever before as a definite factor in making sales.

Welsbach Water Heaters have gained their leadership through their efficient performance (and favorable prices). In fact there is not a single detail of any Welsbach appliance that will not bear close examination by today's buyers. When Welsbach gas appliances are featured, profitable sales are sure to result.



Member of American Gas Association

WELSBACH COMPANY

GLOUCESTER CITY, N. J.

Offices in Principal Cities

Get away from competition ....increase your profits....

WITH THE

A-B ARISTOCRAT

Fully Automatic

GAS RANGE

THAT IMPOSES NO PENALTY ON MANUAL OPERATION

STOP IN FOR A DEMONSTRATION

BOOTH 608 A. G. A. CONVENTION

A-B STOVE COMPANY

BATTLE CREEK, MICHIGAN

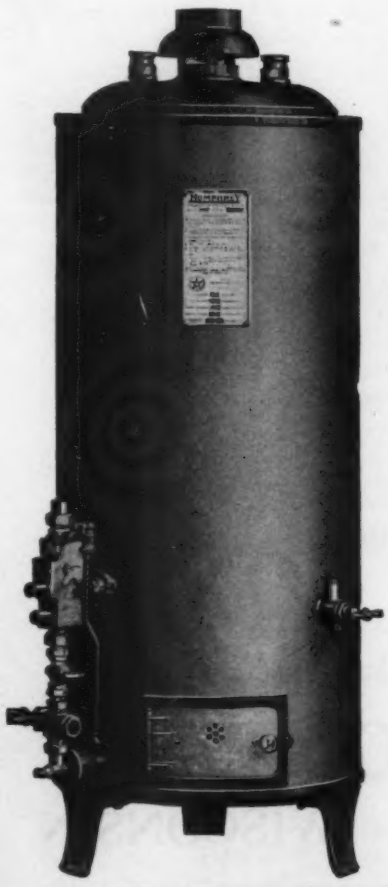
THE MECHANICAL COOK THAT WORKS WHILE YOU'RE AWAY

PROFITS *Let's talk plainly*

CONCERN YOU « MORE » *than anything else*

It pays to push Humphrey Automatic Gas Water Heaters.

Why? Because they show you a greater net profit—profit you can keep—profit that you don't have to put back into costly service calls—profit you make from increased gas sales—to say nothing of the profit you have in satisfied users, who pass the word along to their friends to also become satisfied users.



Humphrey builds an automatic water heater of a type and size to meet every requirement. The Humphrey Kalamazoo Automatic Storage, and the Humphrey Automatic Instantaneous, both supreme in their field.

Humphrey Automatic Gas Water Heaters are built up to a standard, not down to a price. And because every heater gives the utmost in Service, Efficiency, Durability and Safety, you make double profit—the profit from the original sale, and the profit you save from not having to make frequent service calls. Your customer profits, because he gets real value for his money—ample service, lowest operating cost, lowest yearly ownership cost, and absolute safety. And you both profit from the good will the Humphrey builds between you.

That is not theory—it's fact. And as evidence, let us again call your attention to the fact that during the recent business depression Humphrey sales showed a steady increase. There must be a reason —There is a reason. A quality water heater, backed by real advertising and sales cooperation, will sell, regardless of conditions.

If increased profits interest you—get in touch with the Humphrey Merchandise Man in your territory today.

"Booth No. 333"

HUMPHREY COMPANY (Div. Ruud Mfg. Co.) KALAMAZOO, MICH.

INCINERATION *is coming to the front as a* Major Activity

KERNIT and Kleenburn have brought a new significance to incineration and its rightful, proved claim as a major activity. These quality appliances, backed by a stable organization that knows your merchandising problems, have earned a deserved front rank position in leading activities all over the country.

KERNIT and Kleenburn sales are NEW load builders. There is no "trade-in" or service attention to eat up profits. The market for these proved and guaranteed appliances is definite, it is growing, and it has the money with which to buy.

THE Kernit and Kleenburn line, in range of models and prices, is complete. Practical sales plans and selling aids provide you exceptional cooperation in planning and operating a profitable incineration activity. Get the facts—now.

VISIT THE DISPLAY OF KERNITS & KLEENBURNS at our booth at the Atlantic City Convention

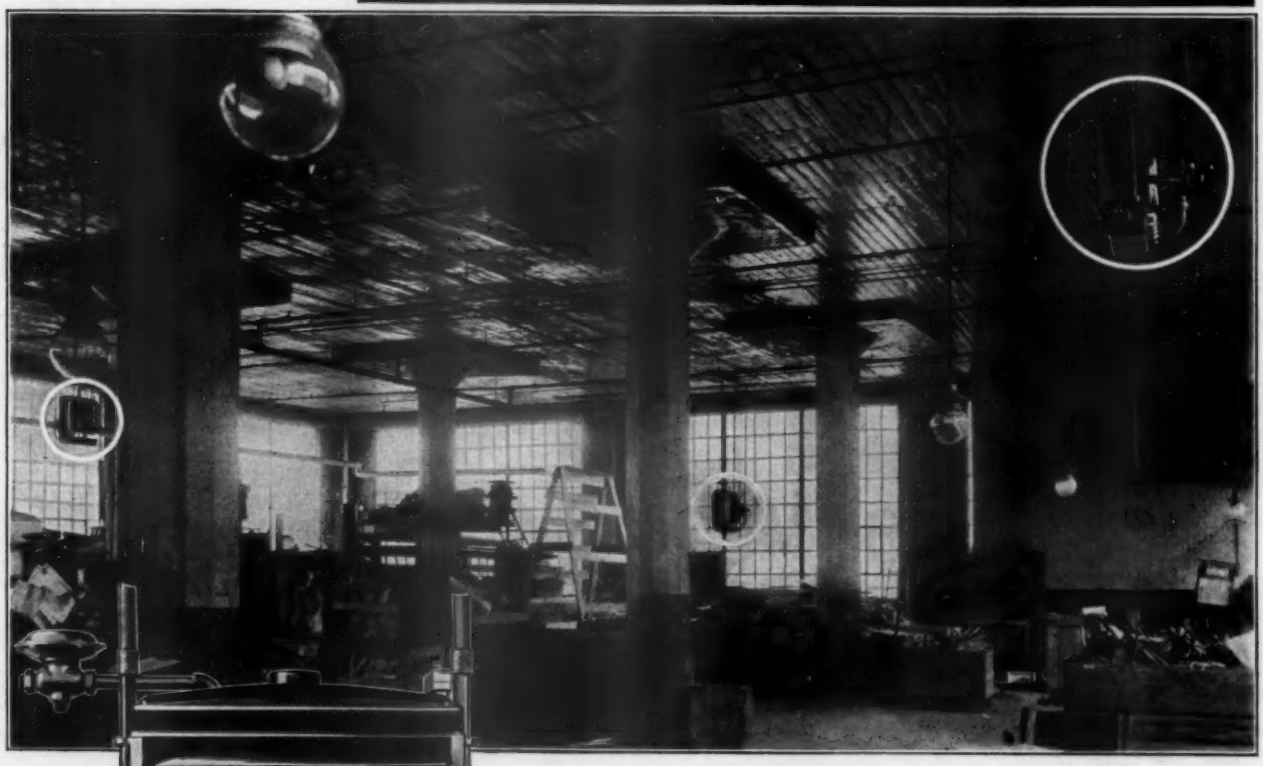
BE SURE TO PROVIDE FOR INCINERATION ACTIVITIES IN YOUR 1931 BUDGET

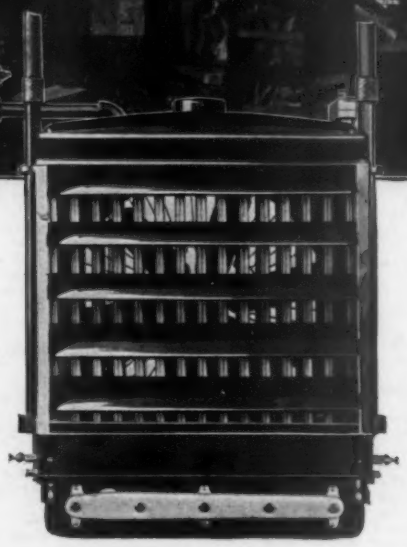
KERNIT INCINERATOR COMPANY

MILWAUKEE - - - - - WISCONSIN

Affiliated with KERNER INCINERATOR COMPANY

The Humphrey Gas UNIT HEATER





no firemen!
no boilers!
no coal!
no ashes!

—just clean and efficient heat when and where you want it!

Humphrey Gas Unit Heaters have conclusively proven the real value of gas heating in workshops, factories, garages, foundries, etc., throughout the country. Pictured above is a battery of Humphrey Gas Unit Heaters in a warehouse and receiving room 120 ft. long, 75 ft. wide with an 18 ft. ceiling. With receiving doors frequently open, a uniform temperature of 65 degrees was maintained in below zero weather by six Humphrey Gas Unit Heaters, several of which are shown in the photograph. Heat can be directed to any desired level. Write for illustrated catalog.

GENERAL GAS LIGHT COMPANY, KALAMAZOO, MICHIGAN, New York - Pittsburgh - Cleveland - San Francisco

ARMCO Jacking Method

is more than Economical to the User . . .

It keeps Traffic Moving

Economy to the user is an important feature in installing conduits and drain pipes under busy highways and railroads by the Armco Jacking Method. But economy of installation over the slow, costly open trench method is greatly amplified in tremendous savings of time to the users of the thoroughfare.

Detours are avoided. Traffic is never delayed a moment, for the entire operation is conducted at the sides and under the traveled surface. In the case of highways, the surface and the foundation are untouched, so there can be no resultant "break" in the pavement, nor injury to adjoining structures.

Armco Corrugated Iron Pipe, champion of 24 years endurance in actual service to date—in "Nature's laboratory"—is jacked through by a small crew of unskilled labor. A hole only the size of the pipe is made. Jacking equipment is as simple as beams and jacks.

For economy now and in the future, install Armco Corrugated Iron Pipe by the Armco Jacking Method, an Armco development. Complete data on request.

Armco culverts and drains are manufactured from the Armco Ingot Iron of The American Rolling Mill Company and always bear its brand

ARMCO CULVERT MANUFACTURERS ASSOCIATION

Middletown, Ohio.

C, 1930, A.C.M.A.

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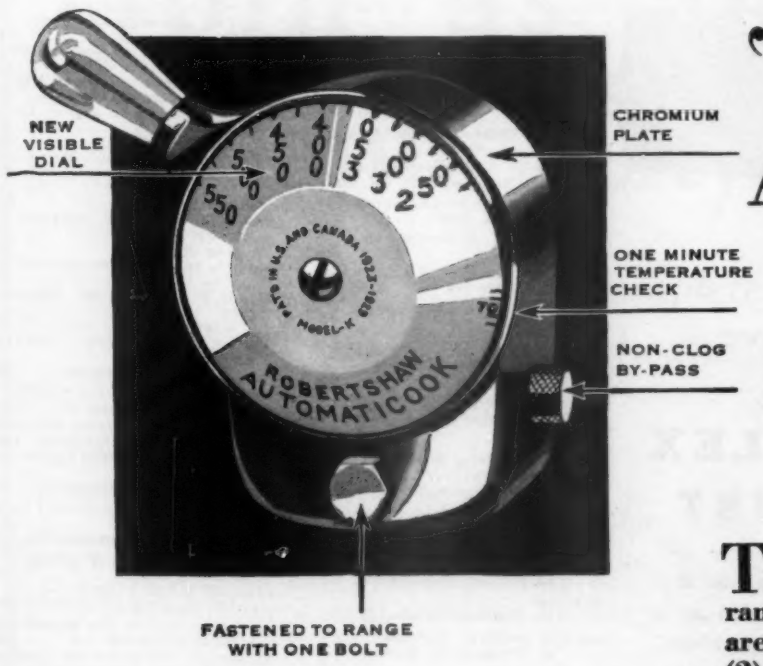
Here it is!
The New Improved "K" Type AutomatiCook *with 5 great Features*



THE NEW "K" type AutomatiCook has five great features to make gas range selling easier for you. Here they are: (1) Handsome chromium plate finish. (2) Fully visible dial. (3) Fool-proof One-Minute Temperature Check. (4) Non-Clog by-pass. (5) Only *one* bolt attachment to range.

The new AutomatiCook is smaller, more handsome, more compact. It's better looking. There's a One-Minute Temperature Check. Every working part is accessible from outside of range.

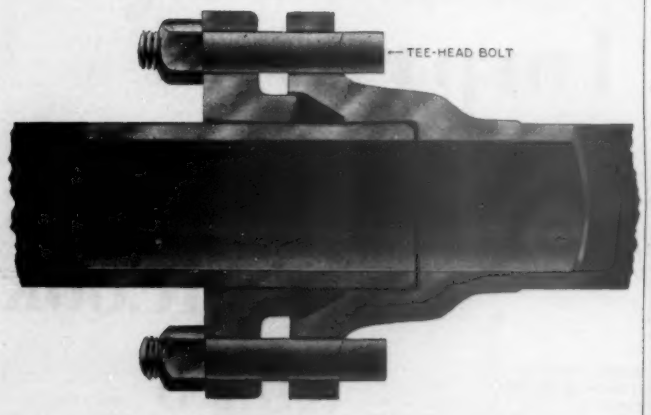
More than 100 makes of the new ranges will be AutomatiCook equipped this year. Learn all about this greatly improved heat control now. Write for full descriptive literature . . . *today!* It might result in your selling more ranges this season.

ROBERTSHAW AutomatiCook

ROBERTSHAW THERMOSTAT COMPANY
Youngwood, Penna.

Tight Joints

at 200 lbs. gas pressure



exhaustive tests prove superiority of

DOUBLEX SIMPLEX

HIGH-PRESSURE JOINT

MR. E. A. MUNYAN, of the Union Gas & Electric Co., Cincinnati, recently ran an interesting and convincing test on Doublex Simplex pipe. He subjected a test line to natural gas pressures of 50, 100, 150 and 200 pounds, each through a duration of 24 hours. No leaks could be discovered. He sealed 200 pounds pressure in the test line and let it stand for 10 days. Daily tests revealed no leaks. He took the line from the trench, deflected it, put it under pressure, and found it as tight as ever. In conclusion, he reported that it is "impossible to make it leak under ordinary hard usage."

Mono-Cast Doublex Simplex cast iron pipe has the advantage of long life, ease of jointing, unusual deflection and ample provision for longitudinal expansion and contraction without leakage at high pressure. It has been adopted as "standard" by some of the largest gas companies. Our nearest branch office will be glad to furnish detailed information and quotation for your next pipe line job.

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Come! Join us at Atlantic City

See this most complete display of gas heating appliances

COME! Join us at Atlantic City, at the American Gas Association Exhibit. Here at the Roberts-Gordon booth, No. 208-209, you will not only receive a hearty welcome, but you will see a most complete display of home heating appliances.

Gas heating appliances for use in round boilers, Arcola units, rectangular boilers and the famous Duplex Unit Controlled Gas Heating System will be displayed. Not alone will this exhibit be complete, but we will plan that it be educational as well.

All the various appliances manufactured by the Roberts-Gordon Appliance Corporation are on display. We want to show you various gas appliances that have set up new sales records for public utilities.

Come! Join us at Atlantic City, October 13th to 17th, inclusive. We want you at our booth. We will make it worth your while.

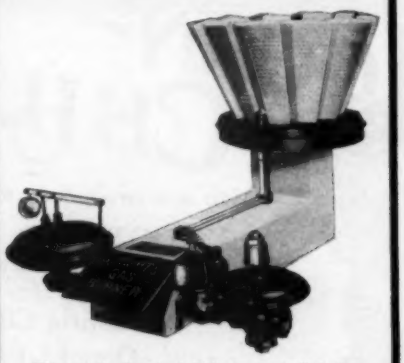
ROBERTS CONTROLLED GAS HEATING UNIT

DUPLEX UNIT CONTROL GAS HEATING SYSTEM

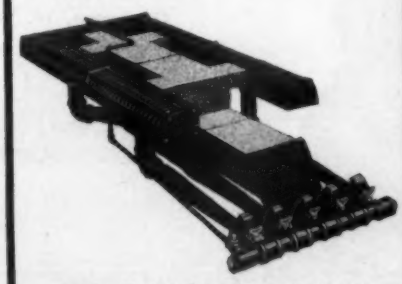
ROBERTS-GORDON APPLIANCE CORPORATION

DELAWARE AVENUE AT TUPPER STREET

CURTISS BUILDING BUFFALO, N. Y.

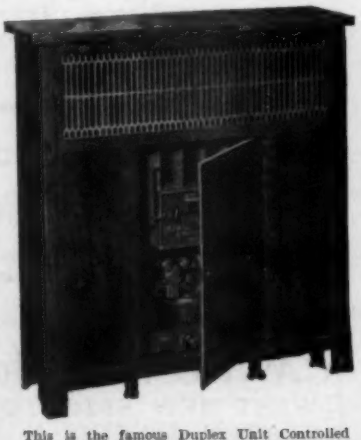


This is the Standard Roberts Controlled Gas Heating Unit. It is widely sold by many of the country's foremost Utilities for converting round boilers or furnaces into gas fired heating systems.



Above is illustrated the Roberts Rectangular Heating Unit for converting rectangular boilers into gas heating systems.

Here is the new Roberts Junior Gas Burner. The low price on this automatically controlled unit places it within the reach of the modest pocketbook, thus opening a wide, unexploited field.



This is the famous Duplex Unit Controlled Gas Heating System. It is being widely used for new installations and for remodeled homes, churches, auditoriums and office buildings.

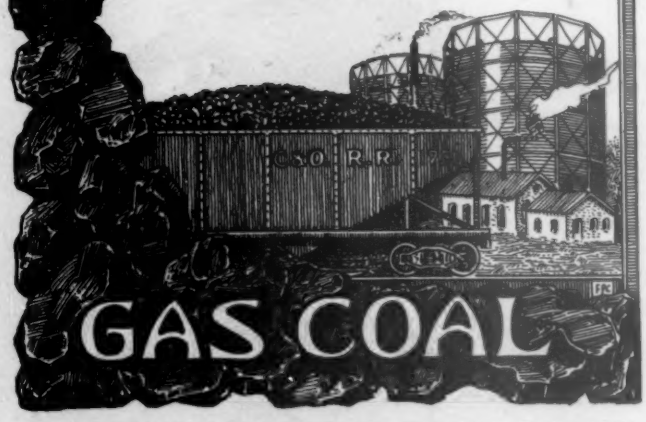
LOGAN-CHILTON

You are invited to visit us at

BOOTH NO. 105
A.G.A. CONVENTION

Atlantic City
Oct. 13-17

Amherst-Logan County Coal Corporation
Kanawha Valley Building,
Charleston, W. Va.



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MITCHELL

ELECTRIC VIBRATING SCREEN

Especially adaptable to the screening of coal and coke. In the re-screening of coke, the terrific vibrations, occurring 3,600 times a minute, remove all breeze at the lowest cost per ton. It requires minimum floor space and head room. It is self-contained, dust and water proof. Requires less than ¾ H. P. per standard screen.

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C.W. HUNT CO. Inc.
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RELIANCE BALANCE VALVE DISTRICT REGULATOR
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SINGLE DISTRICT & DOUBLE DISTRICT REGULATORS
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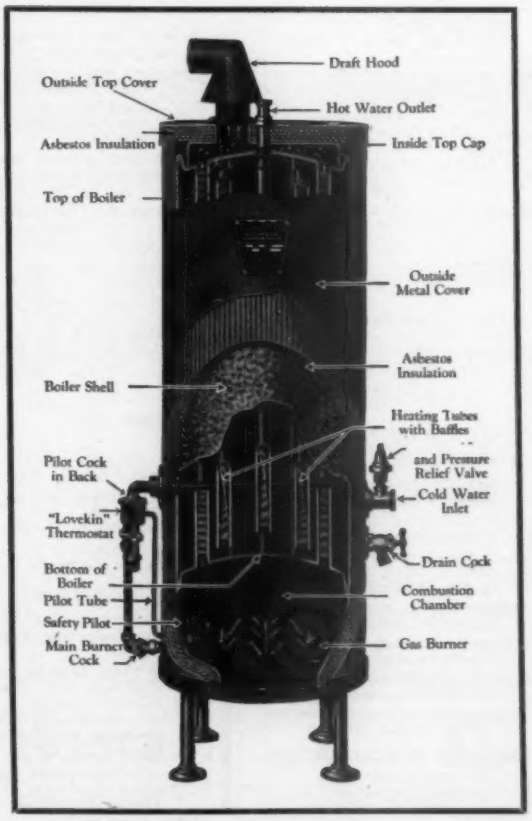

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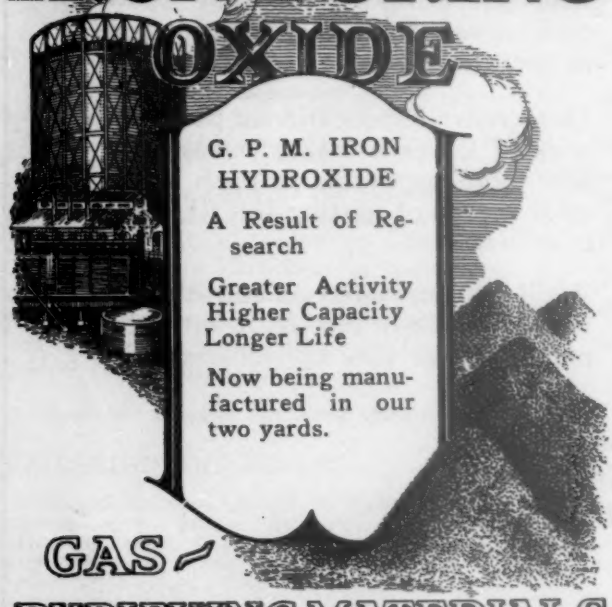

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Wet Meters
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BUSH TERM. BLDG. 4, BROOKLYN, N. Y.

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EDITOR, AMERICAN GAS JOURNAL, 53 PARK PLACE, NEW YORK

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CONSOLIDATED GAS COMPANY OF NEW YORK

GEO. B. CORTELYOU, *President*

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Cruse-Kemper Co.
Gas Engineering Co.
The Gas Machinery Co.
Isbell-Porter Company.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
The Western Gas Construction Company.
High Duty
Stacey Bros. Gas Const. Co.
United Engineers & Constructors, Inc.
Wolverine Tube Co.

CONTRACTORS' TUBS
C. W. Hunt Co., Inc.

CONTROLS
The Bristol Company.
The Brown Instrument Co.
Partlow Corpn.
Robertshaw Thermostat Co.
Combustion
Smoot Engineering Corp.
Gas Pressure
Smoot Engineering Corp.
Gas Producer
Smoot Engineering Corp.
Water Gas Machine
Smoot Engineering Corp.

CONVEYORS
C. W. Hunt Co., Inc.
Isbell-Porter Company.
The Koppers Construction Co.

CONVERSION UNITS
Roberts Gordon Appliance Corpn.
Surface Combustion Co.

COOLERS
The Gas Machinery Co.
Semet-Solvay Engineering Corp.
The Western Gas Construction Company.
Air
Andale Company.
Ammonia Liquor
Andale Company.
Gas
Andale Company.
Oil
Andale Company.
Water to Water
Audale Company

COOLING COILS
The Gas Machinery Co
Semet-Solvay Engineering Corp.
The Western Gas Construction Company.

COUPLINGS
Bartlett-Hayward Co
S. R. Dresser Mfg. Co.
National Tube Co.
Pittsburgh Equitable Meter Co.
The P. H. & F. M. Roots Company.
Victaulic Co. of Amer.

COUPLINGS—FLEXIBLE
The P. H. & F. M. Roots Company.

CUBIC FOOT BOTTLES
American Meter Co.
Lambert Meter Co.

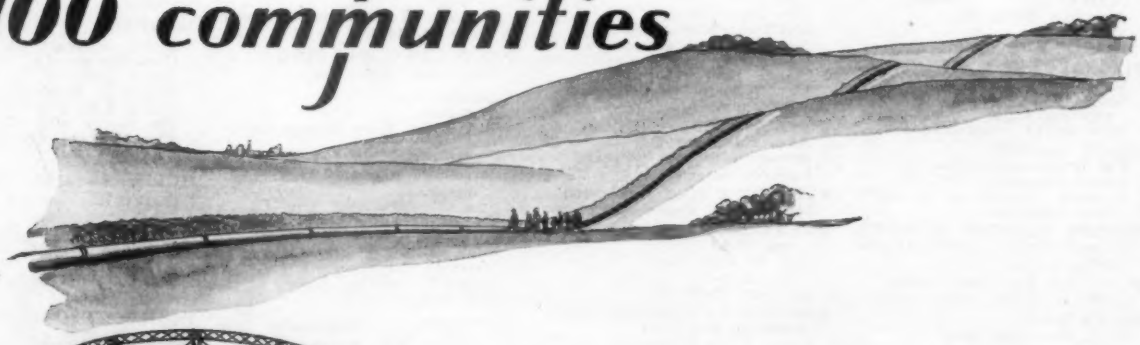
CUTTING APPARATUS & SUPPLIES
Union Carbide & Carbon Co.

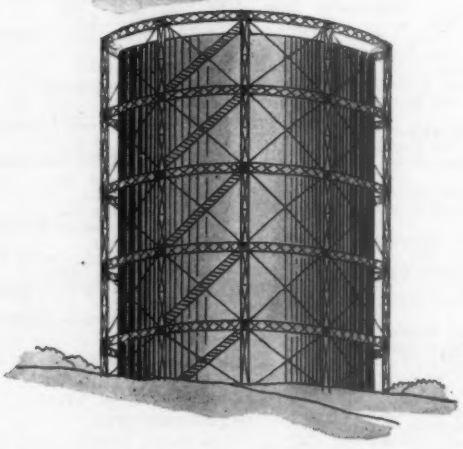
CRUSHERS
McClintoc Marshall Co.

DE-EMULSIFIERS
Semet-Solvay Engineering Corp.
The Western Gas Construction Company.

DEHYDRATORS, GAS
Andale Company.

Gas ~ for more than 100 communities





IN more than 100 progressive and prosperous Middle Western communities, the subsidiaries of North American Light & Power Company supply Gas—either natural or manufactured—for every industrial and domestic purpose.

Forty-eight of these communities are located in Illinois; five each in Iowa and Missouri, and fifty-five in Kansas.

Through supplying this service—one of the most essential to our modern civilization—the Company while prospering itself is helping these communities to prosper. We, and they, recognize our mutual interest and mutual responsibility to work together for the benefit of both the Company and the Community served.

If it's done with heat, you can do it better with Gas

North American Light & Power Company

231 So. La Salle Street Chicago, Illinois

Buyers' Reference Index

See page 153 for advertisements of these products

Semet-Solvay Engineering Corp.
The Western Gas Construction Company.

DEMONSTRATION METERS
American Meter Co.
Lambert Meter Co.

DIAPHRAGMS (Meter)
American Meter Co.
Lambert Meter Co.
Superior Meter Co.

DISCHARGING MACHINERY
Bartlett-Hayward Co.
Improved Equipment-Russell Engineering Corp.
Semet-Solvay Engineering Corp.

DRAFT GAUGES
The Bristol Company
Brown Instrument Co., The
Precision Thermometer & Instrument Company.

DUPLEX HEATING SYSTEMS
Roberts-Gordon Appliance Corpn.
Surface Combustion Co.

ELECTRIC LOCOMOTIVES
C. W. Hunt Co., Inc.

ELEVATORS
C. W. Hunt Co., Inc.

ENGINEERS
American Meter Co.
The Gas Machinery Co.
Southwestern Pipe Joint & Eng. Co.
Combustion
Bartlett-Hayward Co.
The C. M. Kemp Mfg. Co.
Smoot Engineering Corp.
United Engineers & Constructors, Inc.
Consulting
Bartlett-Hayward Co.
Edw. A. Dieterle
United Engineers & Constructors, Inc.
The Western Gas Construction Company.
Contracting
Bartlett-Hayward Co.
Cruse-Kemper Co.
Gas Engineering Company.
C. W. Hunt Co., Inc.
Improved Equipment
Russell Engineering Corpn.
Isbell-Porter Company
McClintoc Marshall Co.
Stacey Gros. Gas Const. Co.
United Engineers & Constructors, Inc.
West Gas Improvement Co.
The Western Gas Construction Company.
Distribution
United Engineers & Constructors, Inc.
Measurement
American Meter Co.
Connersville Blower Co.

EXHAUSTERS
Connersville Blower Co., The
The Gas Machinery Co.
Isbell-Porter Company.
The P. H. & F. M. Roots Company.
The Western Gas Construction Company

EXPANSION BENDS
The Gas Machinery Co.
Semet-Solvay Engineering Corp.

FILTERS, Gas
American Meter Co.

FIREBRICK CEMENT
General Refractories Co.
Quigley Co., Inc.
Refractory & Engineering Corp.

FIREBRICK CHECKER BRICK
The Gas Machinery Co.
General Refractories Co.
Improved Equipment-Russell Engineering Corp.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.

FIRST AID EQUIPMENT
United Engineers & Constructors, Inc.

FITTINGS
S R Dresser Mfg. Co.
Isbell-Porter Company.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
U. S. Cast Iron Pipe and Foundry Co.
The Western Gas Construction Company.
Plain End and Flanged
Cast Iron Pipe Research Association.

FIXTURES
American Lava Corp.

FLOORS, IRON, BRICK, AND STEEL
The Gas Machinery Co.
McClintoc Marshall Co.
Semet-Solvay Engineering Corp.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.

FLOW METERS
American Meter Co.
Brown Instrument Co., The
Lambert Meter Co.

FLUE PIPE (Cast Iron Oval)
Semet-Solvay Engineering Corp.

FURNACES
Gas Fired
Geo. D. Roper Corp.
Gas Soldering
American Meter Co.

GAS ANALYSIS APPARATUS
American Meter Co.
Metric Metal Works.

GASKETS
American Meter Co.
Pittsburgh Equitable Meter Co.
Reynold Gas Regulator Co.
Superior Meter Co.

GAS COAL
Amherst-Logan County Coal Corpn.
Boone County Coal Corpn.

GAS MAIN CONDUITS
Armco Culvert Manufacturers Assn.

GASOMETERS (Test)
American Meter Co.

GAS PLANTS, COMPLETE
Gas Engineering Co.
Improved Equipment-Russell Engineering Corpn.
Isbell-Porter Company.
Philfuels Co.
United Engineers & Constructors, Inc.
West Gas Improvement Co.
The Western Gas Construction Co.

GAS SCREEN
Connelly Iron Sponge & Governor Co.

GASSING MACHINE
American Meter Co.
Lambert Meter Co.
Superior Meter Co.

GAS TAPE
Connelly Iron Sponge & Governor Co.

GAS TESTING APPARATUS
American Meter Co.
Metric Metal Works.

GATE VALVES (See Valves)

GATES—WIND & BLAST
The P. H. & F. M. Roots Company.
The Western Gas Construction Co.

GAUGE BOARDS
The Bristol Company.
Brown Instrument Co., The
Connelly Iron Sponge & Governor Co.
The Gas Machinery Co.
Lambert Meter Co.
United Engineers & Constructors Inc.
The Western Gas Construction Company.

GAUGES
American Meter Co.
The Bristol Company.
Brown Instrument Co., The
Connelly Iron Sponge & Governor Co.
The Gas Machinery Co.
Lambert Meter Co.
Pittsburgh Equitable Meter Co.
The P. H. & F. M. Roots Company.
Superior Meter Co.
The Western Gas Construction Company.
Mercury
Precision Thermometer & Instrument Company.
Pressure-Recording
American Meter Co.
Brown Instrument Co.
Precision Thermometer & Instrument Company.
Siphon
Precision Thermometer & Instrument Company.
Tank
Brown Instrument Co.
Precision Thermometer & Instrument Company.
Water
Precision Thermometer & Instrument Company.

ACETYLENE, WELDING
Oxweld Acetylene Co.

GLOVES
Rubber
Safety Gas Main Stopper Co.

GOVERNORS
Pittsburgh Equitable Meter Co.
Automatic
The Chaplin Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Groble Gas Regulator Co.
Reynolds Gas Regulator Co.
Smoot Engineering Corp.
The Sprague Meter Co.

GOVERNORS (Calorimeter and Double Dry)
American Meter Co.
Reynolds Gas Regulator Co.
Coke Oven
The Chaplin Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
The Gas Machinery Co.
Reynolds Gas Regulator Co.
Smoot Engineering Corp.
District
The Chaplin Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Groble Gas Regulator Co.
Isbell-Porter Co.
Smoot Engineering Corp.
Exhauster
Connelly Iron Sponge & Governor Co.
Connersville Blower Co., The
The Gas Machinery Co.
Isbell-Porter Co.
The P. H. & F. M. Roots Company.
Smoot Engineering Corp.
High Pressure
The Chaplin Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Groble Gas Regulator Co.
Reynolds Gas Regulator Co.
Smoot Engineering Corp.
The Sprague Meter Co.
Laboratory
American Meter Co.
Connelly Iron Sponge & Governor Co.
Lambert Meter Co.
D. McDonald & Co.
Reynolds Gas Regulator Co.
Low Pressure
The Chaplin Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Groble Gas Regulator Co.
Lambert Meter Co.
Reynolds Gas Regulator Co.
Smoot Engineering Corp.
The Sprague Meter Co.
Retort House
Isbell-Porter Company.
Station

GRATES for Water Gas Generators
Semet-Solvay Engineering Corp.
The Western Gas Construction Co.

GRAVITOMETERS
Precision Thermometer & Instrument Company.

GRIDS, for Scrubbers
Semet-Solvay Engineering Corp.
The Western Gas Construction Co.

GUN-REFRACTORY
Quigley Co., Inc.

HEATERS
Feed Water
Andale Company.
For Oil
Andale Co.
American Gas Products Corp.
American Stove Company.
Homestead Heater Company.
Kompak Company.
Roberts-Gordon Appliance Corpn.
Welsbach Company.

HIGH CAPACITY METERS
Lambert Meter Co.

HOISTS
The Gas Machinery Co.
C. W. Hunt Co., Inc.
The Western Gas Construction Co.

HOLDERS
Bartlett-Hayward Co.
Cruse-Kemper Co.
Gas Engineering Co.
McClintoc Marshall Co.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.
The Western Gas Construction Co.

HOPPERS—COAL AND COKE
Bartlett-Hayward Co.
Cruse-Kemper Co.
C. W. Hunt Co., Inc.
McClintoc Marshall Co.
The Stacey Mfg. Co.
The Western Gas Construction Co.

HIGH PRESSURE STORAGE
Cruse Kemper Co.
Stacey Bros. Gas Construction Co.
Stacey Mfg. Co.

HOWARD AUTOMATIC CHARGERS
The Western Gas Construction Company.

HYDROGEN GAS APPARATUS
Bartlett-Hayward Co.
Cruse Kemper Co.
Gas Engineering Co.
Improved Equipment-Russell Engineering Corp.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.
The Western Gas Construction Co.

HYDROGEN SULPHITE TEST (Apparatus)
American Meter Co.

HYDROMETERS
The Brown Instrument Co.
Precision Thermometer & Instrument Company.

INCINERATORS, GAS-FIRED
Kernit Incinerator Co.

INDUSTRIAL GAS MIXERS
The C. M. Kemp Mfg. Co.
Roberts-Gordon Appliance Co.
Smoot Engineering Corp.

INDUSTRIAL TRACK
C. W. Hunt Co., Inc.

IRON BORING OXIDE
Alpha Lux Co.
Gas Purifying Materials Co., Inc.

IRON SPONGE
Alpha Lux Co.
Connelly Iron Sponge & Governor Co.

INSTRUMENTS
Alpha-Lux Company
American Meter Co.
The Bristol Company.
Brown Instrument Co., The
Lambert Meter Co.
Metric Metal Works.
Precision Thermometer & Instrument Company.

INSULATION
Insulating Cements
Refractory & Engineering Corpn.

JOINTS (Pipe)
S. R. Dresser Mfg. Co.
Southwestern Pipe Joint & Eng. Co.
United States Pipe & Foundry Co.
Insulating
United Engineers & Constructors Inc.
Victaulic Co. of Amer.

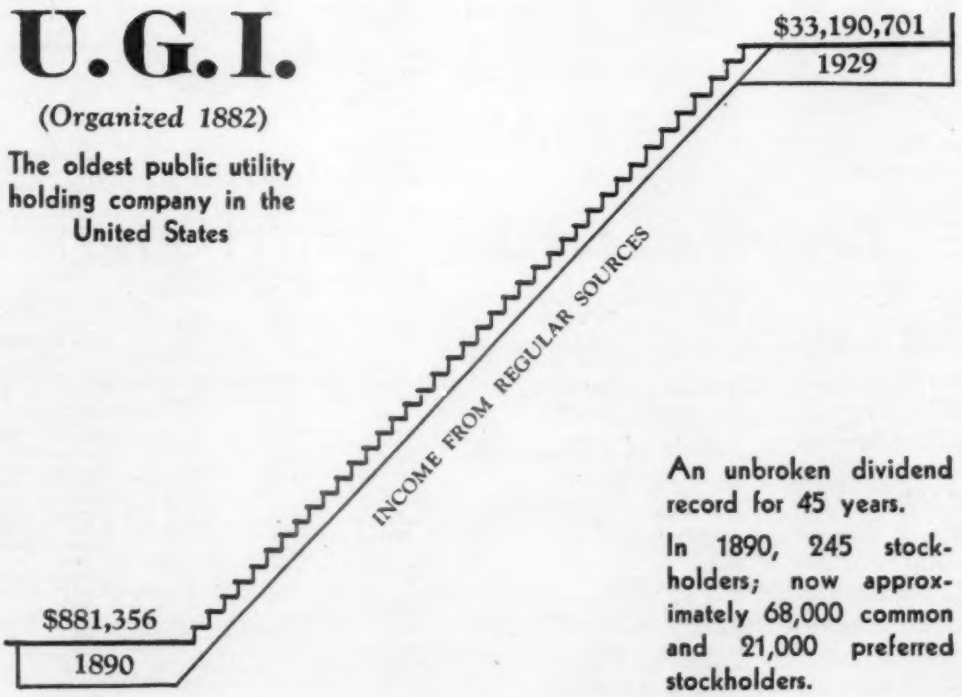
JOINT RUNNERS
Safety Gas Main Stopper Co.

LAUNDRY STOVES
Geo. D. Roper Corp.

U.G.I.

(Organized 1882)

The oldest public utility holding company in the United States



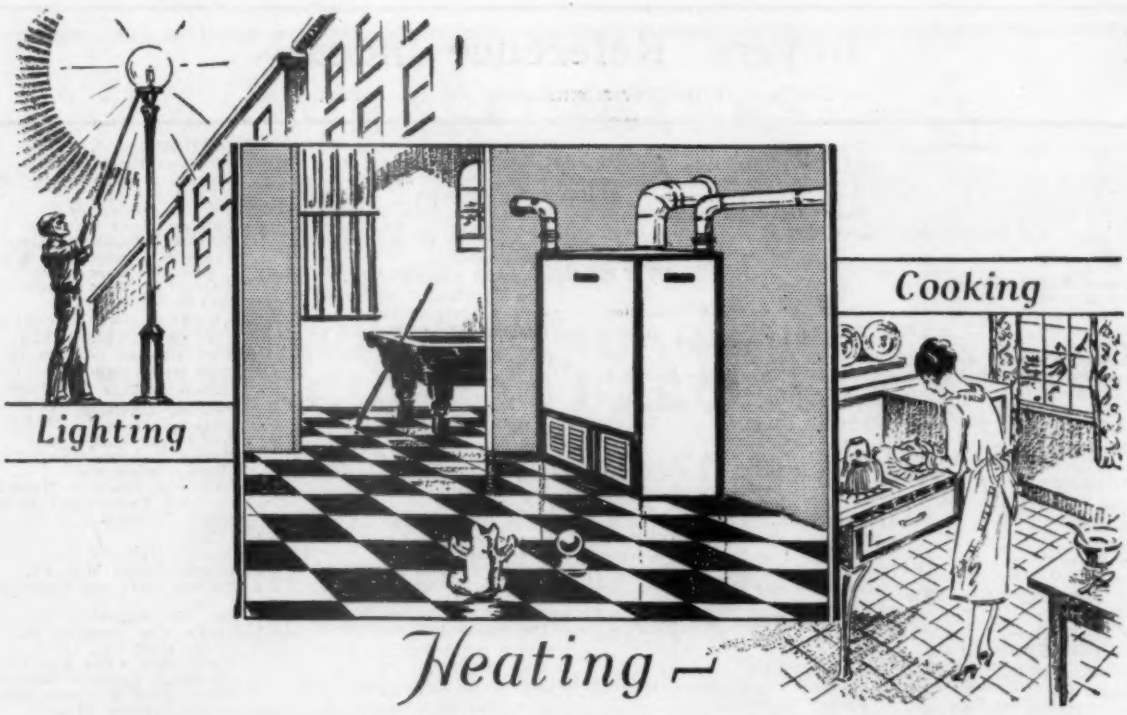
An unbroken dividend record for 45 years.

In 1890, 245 stockholders; now approximately 68,000 common and 21,000 preferred stockholders.

Buyers' Reference Index

See page 153 for advertisements of these products

LAVA BURNER GRIDS
American Lava Corp.
LAVA PILOT TIPS
American Lava Corp.
LINING—REFRACTORY
(See Refractory Linings
LINE PIPE
Electric Weld-Steel.
LIQUEFIED PETROLEUM GASES
Philfuels Co.
LUGS—SOLDERING
Wolverine Tube Company.
LUX MATERIAL
Alpha-Lux Company.
LUX SPONGE
Alpha-Lux Company.
MANILA AND WIRE ROPE
C W Hunt Co., Inc.
MANOMETERS
American Meter Co.
Brown Instrument Co., The
Precision Thermometer & Instrument Company.
MASKS—GAS
Safety Gas Main Stopper Co
MAST & GAFF OUTFITS
C. W. Hunt Co., Inc.
MEASURING CHUTES
C. W. Hunt Co., Inc.
MECHANICAL GENERATORS for Water Gas App.
United Engineers & Constructors, Inc.
The Western Gas Construction Co.
METER CONNECTIONS
American Meter Co.
Bartlett-Hayward Co.
S. R. Dresser Mfg. Co.
Lambert Meter Co.
Pittsburgh Equitable Meter Co.
Superior Meter Co.
METER REPAIRING
American Meter Co.
Lambert Meter Co.
Superior Meter Co.
METER TESTER, Hydro-Pneumatic
American Meter Co.
METERS
American Meter Co.
Brown Instrument Co., The
Pittsburgh Equitable Meter Co.
Air
Brown Instrument Co.
Connersville Blower Co., The
The Gas Machinery Co.
Lambert Meter Co.
The P. H. & F. M. Roots Company.
The Sprague Meter Co.
Superior Meter Co.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.
Artificial
American Meter Co.
Connersville Blower Co., The
Lambert Meter Co.
The P. H. & F. M. Roots Company
The Sprague Meter Co.
Superior Meter Co.
Demand
American Meter Co.
Brown Instrument Co.
Connersville Blower Co., The
Lambert Meter Co.
The P. H. & F. M. Roots Company.
Superior Meter Co.
Demonstration
District
American Meter Co.
Connersville Blower Co.
Dry
American Meter Co.
Connersville Blower Co.
Lambert Meter Co.
The P. H. & F. M. Roots Company.
The Sprague Meter Co.
Superior Meter Co.
Exhibition
American Meter Co.
High Pressure
Natural Gas
American Meter Co
Brown Instrument Co.
Connersville Blower Co., The
Lambert Meter Co.
The P. H. & F. M. Roots Company.
The Sprague Meter Co.
Superior Meter Co.
Oil
American Meter Co.
Brown Instrument Co.
Connersville Blower Co., The
The Gas Machinery Co.
Orifice
American Meter Co.
Positive
The Sprague Meter Co.
Prepayment
American Meter Co.
The Sprague Meter Co.
Superior Meter Co.
Proportional
The P H & F. M. Roots Company
Rotary Displacement
Station
Connersville Blower Co.
American Meter Co.
Brown Instrument Co.
Connersville Blower Co., The
The P H. & F. M. Roots Company
The Western Gas Construction Company
Steam
American Meter Co.
The Gas Machinery Co.
United Engineers & Constructors, Inc
The Western Gas Construction Company
Test
American Meter Co.
The Sprague Meter Co.
Superior Meter Co.
Wet Test
American Meter Co.
METER LEATHER
American Meter Co.
Besse, Osborn and Odell, Inc.
MILLER GRIP PACKING
Connelly Iron Sponge & Governor Co.
MIXERS, GAS
Robert-Gordon Appliance Corpn.
Semet-Solvay Engineering Corp.
Smoot Engineering Corp.
MOISTURE DETERMINATORS
United Engineers & Constructors Inc
MOTORS, AIR OR GAS
Connersville Blower Co.
MOTOR CARS
C. W. Hunt Co., Inc.
NAPHTHALENE EXTRACTORS
Bartlett-Hayward Co.
The Gas Machinery Co.
Semet-Solvay Engineering Corp.
The Western Gas Construction Company.
OIL HEATERS
Andale Co.
ORE, CHROME
E. J. Lavino & Co.
General Refractories Co.
Quigley Co., Inc.
ORIFICE METERS
American Meter Co.
OVENS (BAKERS)
The Bruce McDonald Co.
Geo. D. Roper Corp.
OVENS, COKE AND GAS
Improved Equipment
Russel Engineering Corpn.
The Gas Machinery Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
The Western Gas Costruction Co.
OXIDE
Alpha-Lux Company.
Connelly Iron Sponge & Governor Co.
Gas Purifying Materials Co., Inc.
E. J. Lavino & Co.
OXY-ACETYLENE APPARATUS
Oxweld Acetylene Co.
OXYGEN
Linde Air Products Co.
OXYGEN AND HYDROGEN METERS
American Meter Co.
Lambert Meter Co.
Superior Meter Co.
PACKING
Asbestos
Safety Gas Main Stopper Co
PACKING FIBRE
Refractory & Engineering Corpn.
PAINTS
Cheesman-Elliott Co.
Inertol Co., Inc.
Quigley Co., Inc.
The Stacey Mfg. Co.
Wailes Dove-Hermiston Corp.
Metal Protective
Semet-Solvay Co.
PAINTS, ANTI ACID AND ALKALI
Cheesman-Elliott Co.
Inertol Co.
Quigley Co., Inc.
PAINTS, RUSTPROOF
Cheesman-Elliott Co.
Inertol Co., Inc.
Quigley Co., Inc.
PENTANE
Philfuels Co.
PHOTOMETERS
Connelly Iron Sponge & Governor Co.
PILOTS-SAFETY
Spencer Thermostat Co.
PILOT TIPS
American Lava Corpn.
PIPE
Waylow Pipe Co.
National Tube Co
The Stacey Mfg. Co.
United States Pipe & Foundry Co.
The Western Gas Construction Co.
Bell
American Meter Co.
Semet-Solvay Engineer.ng Corp.
McWane Cast Iron Pipe Co.
Bell and Spigot
U. S. Cast Iron Pipe & Foundry Co.
Cast Iron
American Cast Iron Pipe Co.
Southwestern Pipe Joint & Eng Co.
McWane Cast Iron Pipe Co.
U. S. Cast Iron Pipe & Foundry Co.
Flange
Semet-Solvay Engineering Corp.
U. S. Cast Iron Pipe & Foundry Co.
Screw Joint Cast Iron Pipe
McWane Cast Iron Pipe Co.
Seamless Steel
Spigot
McWane Cast Iron Pipe Co.
Semet-Solvay Engineering Corp.
Steel
Bartlett-Hayward Co.
Cruse-Kemper Co.
The Gas Machinery Co.
National Tube Co.
Pittsburgh Steel Products Co.
Republic Steel Corp.
Semet-Solvay Engineering Corp.
Welded Steel
Bartlett-Hayward Co.
Cruse-Kemper Co.
The Gas Machinery Co.
National Tube Co.
McClintoc Marshall Co.
Semet-Solvay Engineering Corp.
PIPE COATINGS
Quigley Furnace Specialties Co.
Wailes Dove-Hermiston Corp.
PLANTS—GAS, COMPLETE
The Gas Machinery Co.
Improved Equipment-Russell Engineering Corp.
The Koppers Construction Co.
Philfuels Co.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.
West Gas Improvement Co.
The Western Gas Construction Company
PLATES
Cruse-Kemper Co.
C. W. Hunt Co., Inc.
The Stacey Mfg. Co.
The Western Gas Construction Company.
Floor
Gas Engineering Co.
The Gas Machinery Co.
McClintoc Marshall Co.
The Stacey Bros. Gas Construction Co.
United Engineers & Constructors, Inc.
PLUGS, SERVICE AND MAIN
Rubber
Safety Gas Main Stopper Co.
Soft Wood
Safety Gas Main Stopper Co.
PORTABLE TEST METERS
American Meter Co.
Lambert Meter Co.
Superior Meter Co.
PRODUCER GAS PLANT
Gas Engineering Co.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg Co.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.
PRODUCER GAS STEAM
American Meter Co.
PROPANE
Philfuels Co.
PROVERS—Critical Flow for H. P Field Testing
American Meter Co.
PROVERS—METER
American Meter Co.
Lambert Meter Co.
Pittsburgh Equitable Meter Co
Superior Meter Co
PUMPS
Boiler Feed
P. M. Lattner Mfg. Co.
Drip
American Meter Co.
The Gas Machinery Co
Lambert Meter Co.
D. McDonald & Co.
Geo. D. Roper Corp.
Gas
Connersville Blower Co.
The P. H. & F. M. Roots Company.
Geo. D. Roper Corp.
Gas Bag
Safety Gas Main Stopper Co.
Hand
American Meter Co.
Lambert Meter Co.
Safety Gas Main Stopper Co.
Oil
Connersville Blower Co., The
The Gas Machinery Co.
The P. H. & F. M. Roots Company.
Power
Connersville Blower Co., The
The P. H. & F. M. Roots Company.
Geo. D. Roper Corp.
Pressure
Connersville Blower Co., The
The P. H. & F. M. Roots Company.
Service
American Meter Co.
Lambert Meter Co.
Superior Meter Co.
Service Cleaner
American Meter Co.
Lambert Meter Co.
Safety Gas Main Stopper Co.
Superior Meter Co.
Tar
Connersville Blower Co., The
The P. H. & F. M. Roots Company.
Geo. D. Roper Corpn.
Water
Connersville Blower Co., The
The P. H. & F. M. Roots Company.
Vacuum
American Meter Co.
Connersville Blower Co., The
Geo. D. Roper Corpn.
The P. H. & F. M. Roots Company.
PURIFIERS
Bartlett-Hayward Co.
Cruse-Kemper Co.
Gas Engineering Co.
The Gas Machinery Co.
Isbell-Porter Company.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.
Stacey Bros. Gas. Const. Co.
The Stacey Mfg. Co.
Riter-Conley Company.
United Engineers & Constructors, Inc.
The Western Gas Construction Company
PURIFYING MATERIALS
Alpha-Lux Company.
Connelly Iron Sponge & Governor Co.
The Gas Machinery Co.
Gas Purifying Materials Co., Inc.
The Koppers Construction Co.
E. J. Lavino & Co.
PURIFIER TRAYS
Bartlett-Hayward Co.
Connelly Iron Sponge & Governor Co.
Cruse-Kemper Co.
The Gas Machinery Co.
Semet-Solvay Engineering Corp.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.
United Engineers & Constructors



THE THIRD DISCOVERY OF GAS

Gas began to displace candles and whale-oil for LIGHTING in this country about 1815. Then, as gas lights were themselves being displaced by electric bulbs in the 90's, a new use for gas became popular—COOKING.

The third discovery of gas did not take place until the past decade. Gas was found to be superior for HEATING. This new demand helped to make the production of gas during the last ten years greater than the total produced during all the previous 110 years of the industry.

Gas for House Heating

House heating by gas holds an especially bright future.

It banishes from winter months the burden of shoveling fuel, handling ashes, building new fires, regulating heat. Lighted in the fall, a gas furnace automatically maintains a constant temperature indoors all winter.

Burning of gas helps in conservation of fuel. A ton of coal, burned in the average household furnace, gives only half as many heat units as the gas produced from a ton of coal in a gas manufacturing plant.

Gas is a clean fuel; it does not soil curtains, hangings, or walls. With gas heat the cellar becomes a habitable part of the house.

Associated Increase 33% a Year

Two facts emphasize possibilities of house heating by gas. It is estimated that of about 13 million domestic customers in this country, only about 75,000 use gas for house heating. While the average customer uses only 30,000 cubic feet of gas a year, the consumer using it for house heating burns 300,000 cubic feet a year.

Although less than one-half of 1% of the Associated System's gas customers use gas for house heating, yet their consumption was 7% of total sales in 1929. Homes heated by gas supplied by the Associated System are increasing at the rate of 33% a year.

To invest or for information, write to

Associated Gas and Electric System

61 Broadway New York City

Buyers' Reference Index

See page 153 for advertisements of these products

The Western Gas Construction Company.

PYROMETERS
The Brown Instrument Co.
The Bristol Company.
The Western Gas Construction Company.
Indicating
The Brown Instrument Co.
The Gas Machinery Co.
United Engineers & Constructors, Inc.
Recording
The Brown Instrument Co.
The Gas Machinery Co.
United Engineers & Constructors, Inc.

RADIATORS
Gas Steam
American Gas Products Corp.

RADIATORS—VERTICAL FIN
Wolverine Tube Co.

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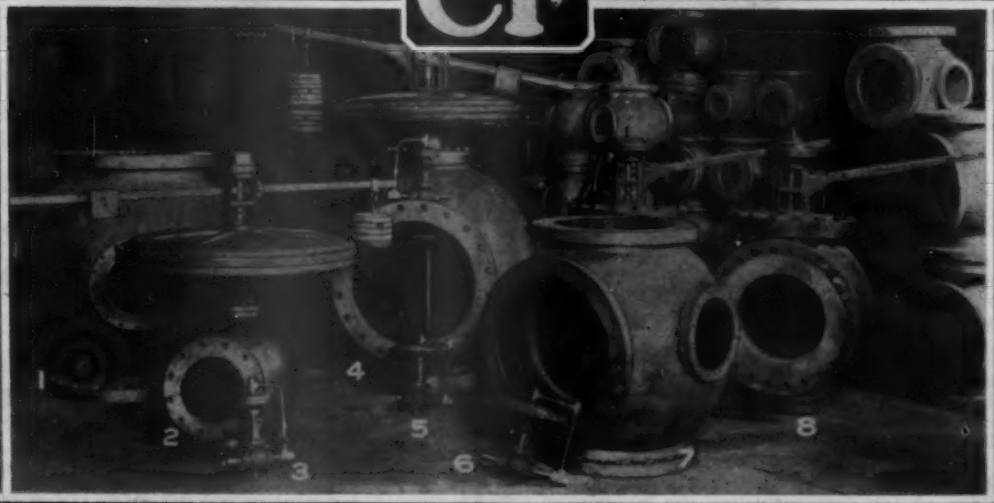

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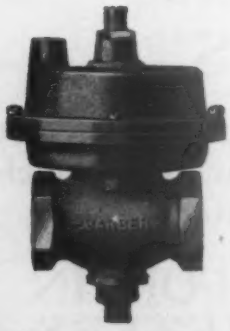

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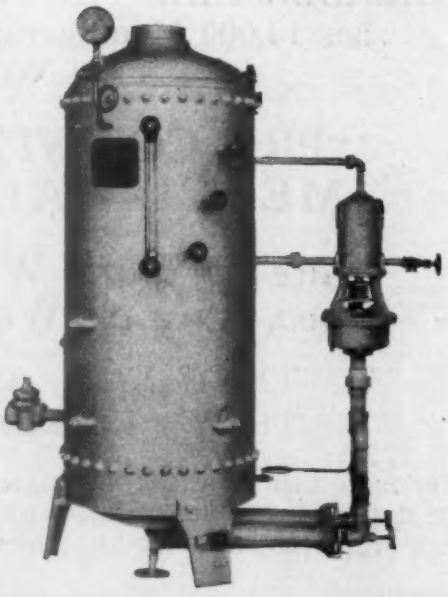

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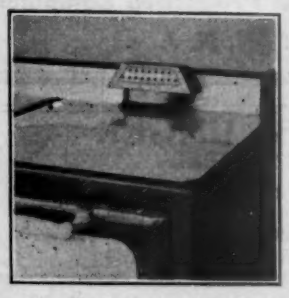

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